What If . . .? The Popularity Of Strategy Games

COMPUTE!'s GAZETTE

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December 1984
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For Owners And Users Of **Commodore VIC-20**™ And **64**™ Personal Computers

Also In This Issue:

Simple Answers To Common Questions

Programming Commodore's Magic Voice

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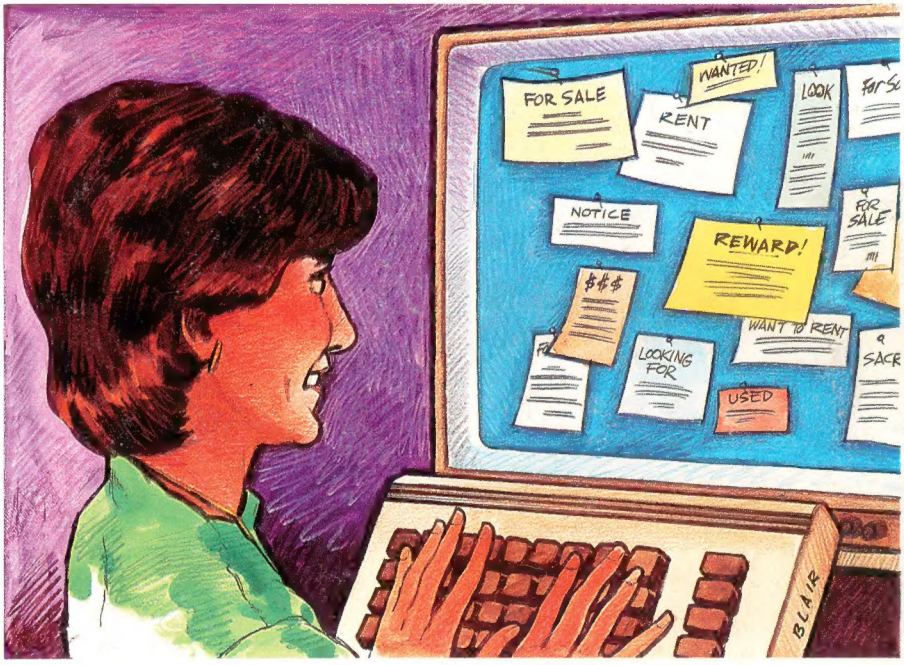
And More



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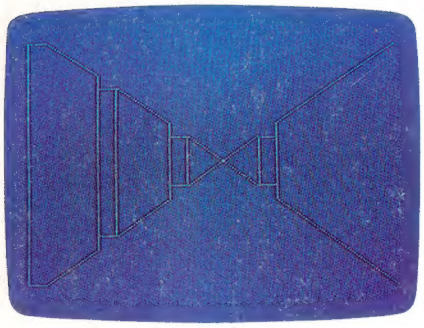

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Save programming time with this versatile line numbering utility for the VIC and 64. Also instantly deletes unwanted lines.

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A look at the variety of new trivia games available for the 64.

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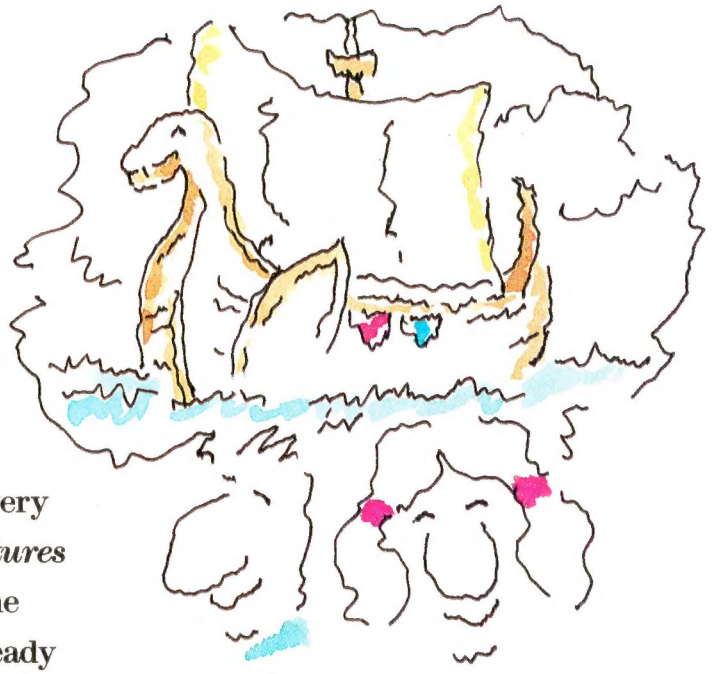
A Nice Christmas Story



Christmas Day was approaching in the Nice household. But Mr. and Mrs. Nice (Bill and Janet) didn't know what to get for their Nice children, Tom and Marybeth. They thought and thought, but nothing seemed to hit them just right. "Hula hoops?" said Bill. "No," said Janet. ● Tom and Marybeth, on the other hand, knew exactly what they wanted. In fact, they dreamed of it almost every night: *DawnTreader*, the latest in the *Adventures In Narnia* computer game series based on the stories by C.S. Lewis. Tom and Marybeth already had the first game, *Narnia*, but now they dreamed about how they would captain the good ship Dawn Treader through the ocean to World's End. They dreamed about finding dufflepuds and sea serpents. And they knew that, just like *Narnia*, *DawnTreader* would be exciting, action-packed, and even educational, teaching them sound principles their Mom and Dad agreed with, too. But they wondered: would *DawnTreader* be under the tree come Christmas Morn? ● One day very close to Christmas, Bill and Janet Nice reached into the cupboard for *Narnia* (after all, it's a game *every*one in the family can enjoy) and came across a note. It said, "We're dreaming of *DawnTreader*. Love, Tom and Marybeth."

● Finally, Bill and Janet had their answer. "It's perfect!" exclaimed Bill. "Let's get them the next Narnian adventure, *DawnTreader!*" "Oh Bill," sighed Janet, "What a nice idea!" ● It was. Wouldn't it be nice for your children, too?

Merry Christmas from the Nice household to yours!

DawnTreader is available at all Waldenbooks stores and computer specialty stores. All *Adventures In Narnia* games are compatible with Apple II series® and Commodore 64™ home computers.

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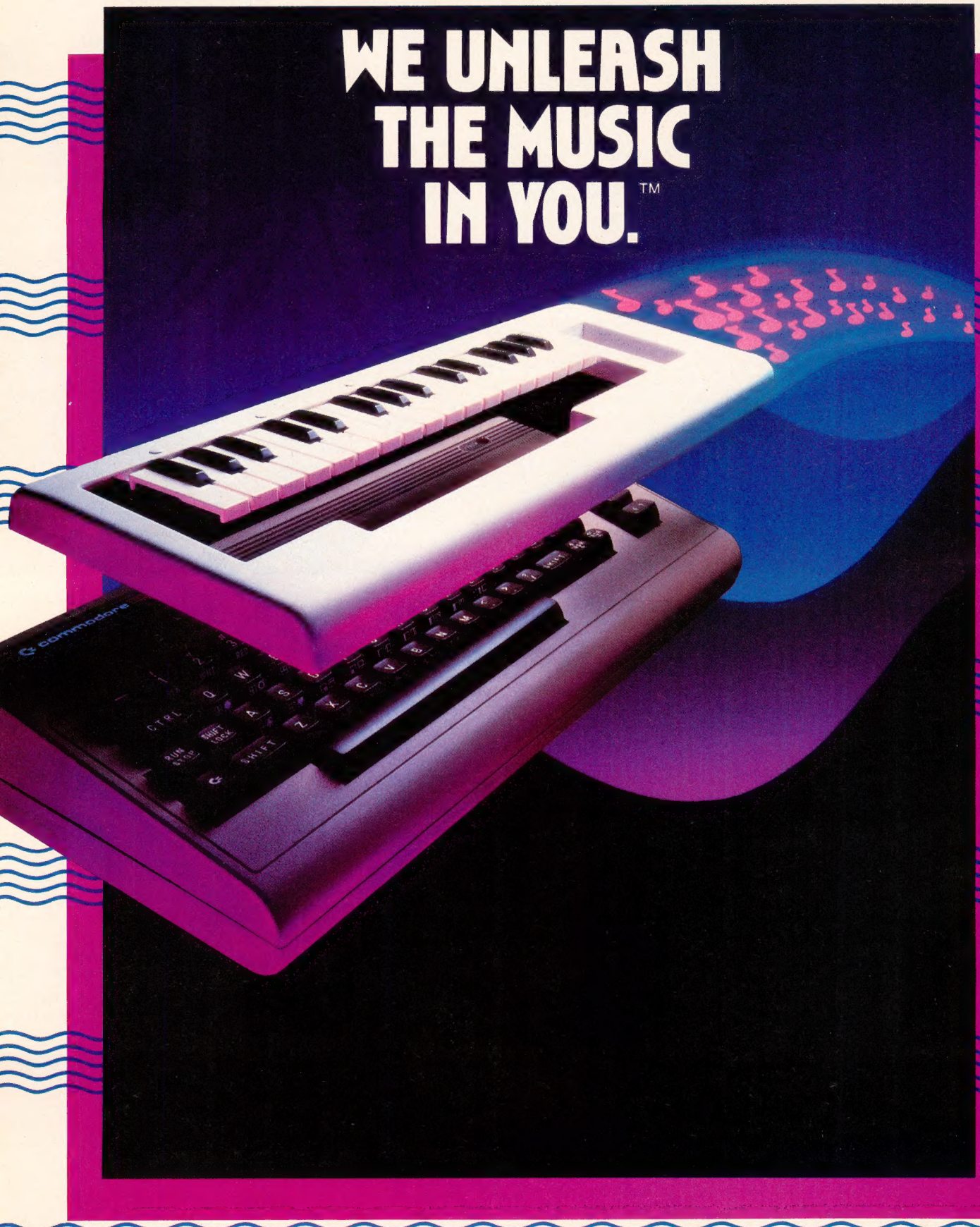
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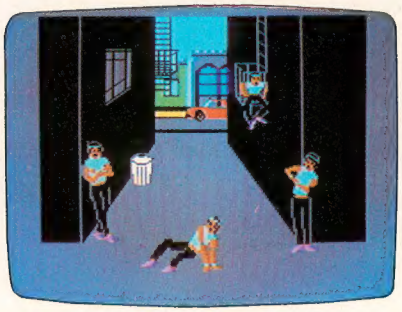

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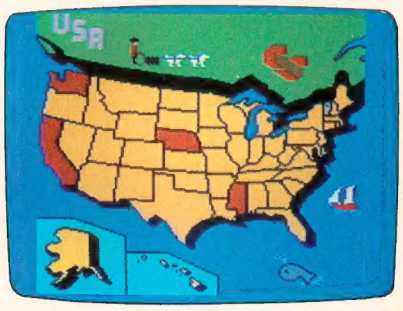

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December 1984 Vol. 2, No. 12

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THE EDITOR'S *notes*

GAZETTE Editor Lance Elko summarizes recent events at Commodore and looks forward to a new year here at the GAZETTE in this guest editorial.

Robert Lock, Editor In Chief

In early October, Commodore held a press conference to officially announce the kickoff of the Plus/4 and 16. Unofficially, however, not everyone at Commodore is excited about the prospects of the new machines. One source reported that there is a significant number of key employees who "just aren't behind the new computers."

Another staff member noted that some Commodore people are looking past the Plus/4 and 16 to the new Amiga (see last month's Editor's Notes), which could be on the market by early Spring. Although the Plus/4 and 16 have some advantages over the 64 and VIC, they're not technological breakthroughs. Good programming and utility machines, maybe, but not significantly different from the immensely successful VIC and 64.

Still, Commodore is proceeding with a major marketing campaign for the Plus/4 with ads in national magazines and major prime-time TV spots. It's doubtful that Commodore can repeat fiscal 1984's whopping sales figures with just the addition of the Plus/4 and the 16. Commodore's 1984 Annual Report shows net sales of $1.267 billion, almost double 1983's $681 million.

Apparently, Commodore isn't relying completely on these two new machines to carry them through the year. Aside from the Amiga, there may be other entries in the wings. Sig Hartmann, President of Commodore's Software Division, noted at the press conference that Commodore is planning to show the C-128 (128K) computer for the home market at January's CES. He also stated that, in addition to the Amiga, an "80-column machine is coming out very, very shortly," and this, too, will be demonstrated at CES. No other details were offered, but Hartmann added that Commodore is now aiming to compete at every level in the microcomputer marketplace.

It will be interesting to see if the Plus/4 and 16 outsell the 64 this Christmas. Hartmann sees this as a possibility, but adds "the 64 is our mainstay machine. The Plus/4 is a productivity machine. It's the next level of the marketplace...for different groups of people." Commodore plans full software support for the Plus/4 and 16, and indicates a growing interest from third-party software developers. At its introduction, 26 packages were immediately available for both machines, and many more should be on the shelves as you read this.

Hartmann also noted that Commodore has plenty of spare parts for VIC owners who don't wish to upgrade—"If people have a problem, we will fix it."

On another note, Commodore said that the previously announced Plus/4-compatible SFS 481 parallel disk drive will be released in January as the Commodore 1551, with a price tag that's $60 to $70 higher than the 1541. The 1551 is not compatible with the 64.

New Horizons

This issue marks the final appearance of our VICreations column by Dan Carmichael. Next month, Charles Brannon's Horizons:64 column will take on a new dimension. With a new title, simply *Horizons,* Charles will cover not only the 64, but also the VIC, the Plus/4, and the 16.

Thanks to you, the GAZETTE has continued as the leading magazine for Commodore users. Our paid circulation of 200,000 in January 1984 has grown to well over 300,000 with this, our final issue of the year.

In the next 12 months, we plan to continue offering the best articles, reviews, and programs for Commodore users, and we promise to stay innovative. We appreciate your support in 1984 and look forward to an even better year in '85. Happy Holidays.

Lance Elko
Editor

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GAZETTE FEEDBACK

EDITORS AND READERS

Do you have a question or a problem? Have you discovered something that could help other VIC-20 and Commodore 64 users? Do you have a comment about something you've read in COMPUTE!'s GAZETTE? We want to hear from you. Write to Gazette Feedback, COMPUTE!'s GAZETTE, P.O. Box 5406, Greensboro, NC 27403.

Note To Readers

In the October issue, page 132, we incorrectly listed the phone number of the Modem Times. The correct number is (303) 578-5405.

An End To Disk Drive Chatter

When loading commercial software, the disk drive often makes a loud chattering noise while reading the program. This is usually caused by a copy protection technique used by software distributors, whereby the disk drive is forced to read a bad track or sector on the disk.

Over a period of time, this repeated vibration of the drive's read/write head could damage the drive, or cause the stepper motor assembly which positions the read/write head to slip out of adjustment.

Here is a short program that, in most cases, will prevent this chatter when loading commercial programs. It will prevent the head from bumping when going to track one.

Type the following one line program in the immediate mode (without a BASIC line number) and press RETURN. It will reprogram the disk controller, and should be entered just before loading the commercial software. After it is entered, load the software according to the directions. This program is about 90% effective, but in cases where it does not stop the chattering, it shouldn't interfere with the proper execution of the commercial program. Try it, and your 1541 will thank you.

```
OPEN 15,8,15:PRINT#15,"M-W";
CHR$(106)CHR$(0)CHR$(1)CHR$(133):CLOSE15
```

Gilbert D. Helland

Thanks for the very useful tip. Many readers have written and inquired about the possibility of damage to their disk drives when this "chattering" is encountered. We tested this program on software from five different software manufacturers, and it worked well with all. One other game, however, returned a message that the disk was a copy (even though it was the original).

Special Brackets And GAZETTE Listings

I recently purchased a VIC-20 and am in the process of teaching myself how to program. In doing so, I have typed in some of the programs from the GAZETTE, but have encountered a problem.

In many of your programs you use the special brackets:

In your section "How To Type In COMPUTE!'s GAZETTE Programs," you explain that this is done by holding down the Commodore key while pressing the key inside the brackets. Your listing shows:

{8} C= 8

With any of these I get the uppercase as though I had used the SHIFT key. Also, when using the "Automatic Proofreader," I get the wrong REM values on lines with the special brackets. Can you tell me what I am doing wrong?

Russell Willis

You aren't doing anything wrong. A VIC-20 has eight different character colors. You change character colors by holding down the CTRL key and pressing one of the numbered keys from 1 to 8; the color you'll get is printed on the front of the key. BLK is black, WHT is white, and so on.

If you're in quote mode, however, pressing

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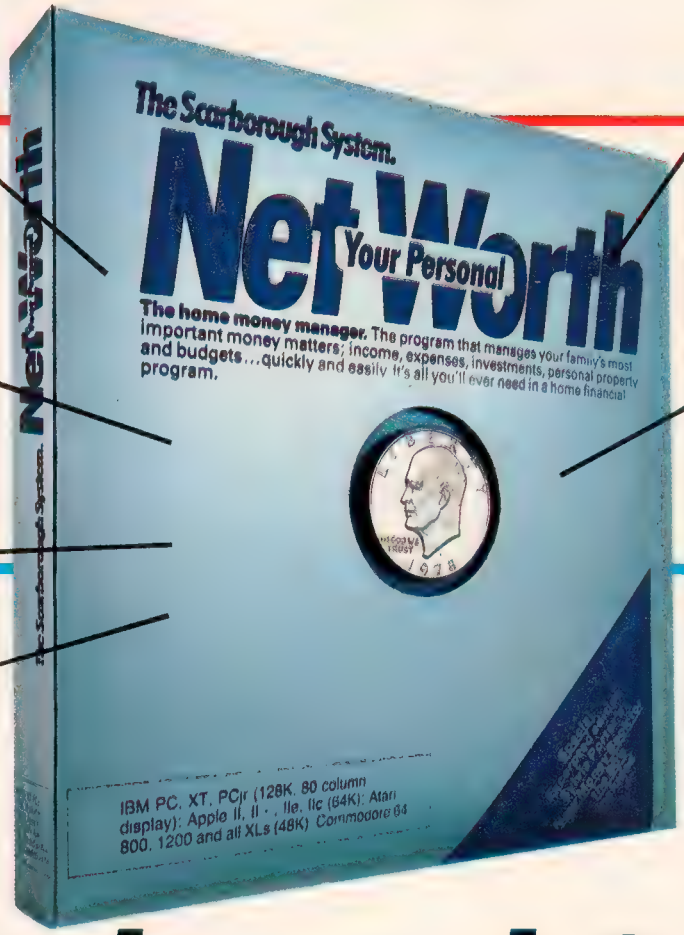
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CTRL and a color key will result in a graphics character. This is useful when you want to change colors in the middle of a string.

When Commodore developed the 64, the designers decided to add eight more character colors, for a total of 16. Among the new colors are a brown, a light blue, and three shades of gray. The new colors are accessed by holding down the Commodore logo key and typing one of the numbers between 1 and 8. The eight colors which use the Commodore key on the 64 are not available on the VIC, which treats a Commodore-8 the same as a SHIFT-8 and prints a left parenthesis.

In one case, "3-D Tic-Tac-Toe" (June), a GAZETTE program originally written for the 64 was translated for the VIC and some of the inaccessible color codes were left in the listing. The solution is to omit the character altogether, or use the CTRL alternative. Either way, the Proofreader checksum will not match up.

PEEKless SID Registers

I'd like to examine the SID (Sound Interface Device) registers in my 64 while my music program is playing. However, the SID registers are *write only registers*, and a PEEK at one of them always returns a zero. Is there any way to examine these registers to see if the voice gate is on or off, or what any of the SID parameters currently are? My program is interrupt driven, so I can check these registers while the program is running.

Mark Wardenburg

Unfortunately, there is no way to PEEK these registers and get an accurate value. The chip that runs your 64 treats the SID registers as if they occupy memory locations, but a POKE to the SID chip actually sends a one-way electrical signal to certain pins. Trying to PEEK the SID chip registers is like trying to get water to run uphill through a hydroelectric dam. On some 64s a value other than zero might be returned with a PEEK, but they may be random values, and should not be trusted.

However, there is a useful programming technique that will allow you to monitor the values you have POKEd into the SID registers. The 25 SID registers most frequently used to produce sound are the memory locations between 54272 and 54296.

First, set aside 25 bytes in an unused area of memory. Two possibilities are the cassette buffer (828–1019), or the unused area of memory between 679 and 767. These 25 bytes will correspond to the 25 SID registers between 54272 and 54296. For example, when using the area between 679 and 767, byte 679 would correspond to SID register 54272, and 703 to 54296. There is also 4K of available RAM starting at 49152.

In your program, first POKE the values you wish to place in the SID registers into the corresponding memory location in the reserved area. Then move the value from this memory location into the SID chip. Use a loop (in BASIC or ML) to PEEK the value in memory and POKE the value to the SID chip. You still can't PEEK the SID chip, but you can *PEEK its mirror image.*

All of the SID registers except two are write-only—you can POKE but not PEEK. Your POKEs provide the input which triggers the chip to output sounds to a television or monitor speaker. The two unusual locations are at 54299 and 54300, and like ROM, are read-only. The first of these, 54299, reads the upper eight bits of the waveform output of oscillator three. This is very handy for machine language programmers who need random numbers. At the beginning of an ML program, set voice three to a white noise waveform with the highest possible frequency and an envelope of zero attack, zero decay, maximum sustain. Any time you need a random number, LoaD the Accumulator (LDA) from location 54299 ($D41B). The result is an (almost) random number from 0 to 255.

Cool Disk Drives

If you leave your 1540 or 1541 disk drive on for extended periods of time, causing it to heat up, here's a tip.

An inexpensive air purifier placed upside down over the vent grills on the top-rear of the disk drive will reduce the temperatures of the chips, and eliminate the hot spots felt when leaving your drive on for extended periods of time.

I use a Norelco model HBO999 because of its compact size and horizontal outlet. I have removed the scented crystals leaving the wire mesh to act as a coarse filter, thus increasing air flow.

I chose to blow air into the drive rather than draw it out for two reasons. First, it forces air directly onto the chips and out past the read/write head assembly. Second, it provides the option of filtering the air before it is introduced into the disk drive.

Sealing the fan unit to the drive can be enhanced by cutting out a foam gasket and placing it between the air purifier and the drive. Appearance can be enhanced by removing the purifier's legs.

Gerry Bamon

Thanks for the tip. Most of the cooling fans advertised for the 1540 or 1541 work on this principle. That is, they are flat fans laid on top of the ventilation grills. You might also place a piece of lintless cloth over one end of the air purifier.

Be sure to remove the filters made of citrus, charcoal, or any other filtering agent of this type. Any particles falling into the disk drive could cause damage.

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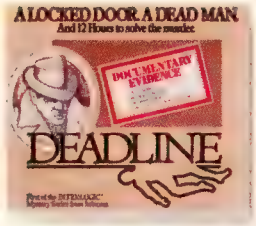
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Oversized Variables

In many of your programs for the VIC and 64, I have seen statements such as:

```
FOR ADRES = 123
```

What is *ADRES?*. I thought variables in a program were limited to two characters.

Tim Cronsberry

When programming in BASIC, you are limited to two significant characters. You can give your variable names more than two characters, but anything after the first two will be ignored by the operating system.

Using names with more than the allowable number of characters can be beneficial because it makes the program more readable. The variables used can be understood more easily.

But you must remember that only the first two characters have any significance. For example, when writing a payroll program, a variable name of HOURLYWAGE *would make the listing easier to follow. However, if you have another variable in the same program with the same first two letters (*HOURSTOTAL, *for example), the computer would treat them as if they were the same variable,* HO, *and you would not get the desired results. In addition, you must watch for embedded BASIC keywords. For example, the keyword* TO *(as in FORJ=1TO10), if used in a variable such as* TOTALHRS, *is embedded and will cause a syntax error.*

If you do use variable or string names with more than two characters, make sure the first two characters are unique.

Spinning The Disk Drive

In the June 1984 issue, Jerry A. Coy had a question about spinning the disk while cleaning the disk drive. Here's a short program I wrote to help me clean my disk drive. It will move the read/write head back and forth from track 1 to track 35. This will maximize the potential of your cleaning disk, and provide a back and forth cleaning motion as well as that of the motor spinning.

If you have a drive with an address other than 8, change line 5 to *U* (= your drive number). To change how long the program runs, vary the loop in line 20 (each pass through takes about 10 seconds).

To use it, load the program, prepare the cleaning disk per the manufacturer's instructions, insert the cleaning disk into the drive, and enter RUN.

```
5 U=8
10 OPEN 15,U,15
15 OPEN2,U,2,"#"
20 FOR J=1TO4
30 PRINT#15,"U1:2 0 1 1"
40 PRINT#15,"U1:2 0 35 1"
50 NEXT J
60 INPUT#15,A$,A$,A$,A$
70 CLOSE2:CLOSE15
```

Random Number Ranges

I have a question about generating random numbers on my 64. How can I make my computer generate random numbers between 100 and 200 by steps of 5?

David Tan

There are a number of different ways to generate a range of random numbers in steps. Here are the two most straightforward.

The range of numbers you need (100–200) contains 21 different unique numbers. If you generate a random number between 0 and 20 (this covers the range of 21), multiply it by 5 (producing the steps by 5) and add it to 100 (which gives you the low base of 100), you will get the desired results. Here's a sample program to show how it's done.

```
10 A=INT(RND(1)*21)+0
20 A=A*5+100
30 PRINTA:GOTO10
```

Another method is to generate a random number between 100 and 200 then check to see if it is one of the desired numbers. This can be done with a FOR-NEXT loop that is incremented by steps of five. Here's how it works. Generate a random number within your range of 100–200, then via the FOR-NEXT loop check to see if it is equal to 100. If not, increment your loop by five and check to see if the number is equal to 105 and so forth up to 200. If no equal condition is found, generate another random number and start the process again. This method is much slower than the first example. Here's a sample program.

```
10 A=INT(RND(1)*101)+100
20 FORB=100TO200STEP5:IFA=BTHENPRINTA:GOT
   O10
30 NEXT
50 GOTO10
```

Bad Vibrations

When I purchased my 1541 disk drive, it came with a card inserted into the drive that said Head Vibration Protector. The instructions on the card stated that it should be inserted into the disk drive and the door closed each time the disk drive is moved.

Well, I have my computer and disk drive on a table that rolls so I can pull it out when in use, and push it back when I'm done. Even though I frequently move the table back and forth, should I keep the card inserted into the drive as instructed? Will it harm the read/write head if I don't?

Steve Trigili

The cardboard head protector that came inserted

Illustration: Stephen Hickey

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with your disk drive serves a dual purpose. Not only does it protect the head during shipment by providing it with a semi-soft surface to rest on, but it also stops the stepper motor assembly from moving back and forth. It can't hurt to insert the card into the drive whenever it is moved, no matter how far.

Sound Interference

I own a VIC-20 and have discovered that without using expansion memory, there isn't much [memory] to work with. Is there a way to find out how many bytes I have used, or how much memory is left?

In another area, I've noticed that a few of the games I've typed in from the GAZETTE cause buzzing sounds on my TV. In fact, the buzzing is so loud at times that I can't hear the beep of the characters. One such game is "React." It doesn't buzz until the white border is added to the black screen. Is it my TV or my all-thumbs programming?

Thomas Putt

To determine how many bytes are free, enter PRINT FRE(0). This command returns the number of bytes of unused BASIC memory. One way to determine how many bytes a program is using is to jot down the amount of memory free when you first turn on your VIC (3581 in the unexpanded VIC, for example). After loading or writing your program, enter PRINT FRE(0) and subtract the resulting number from the original bytes free. This will tell you the number of bytes used by your BASIC program.

In addition to BASIC programs, variables use memory. If you ask for the amount of free memory before and after running a program, you will probably find you have less when the program has finished. This is why it's possible to run out of memory halfway through a program. There are numerous techniques for saving memory. Deleting all REMark statements is probably the most common. Since each BASIC line takes up a minimum of five bytes, putting more than one statement on each line can open up some memory. And if you're using numeric arrays which hold whole numbers, use integer arrays (P%(5)) rather than P(5), for example. Integer arrays use only two bytes per item compared to five bytes for floating point arrays. Unfortunately, this does not hold true for non-array variables; both integer variables and regular floating point variables take up five bytes (plus two for the variable name).

One solution to your buzzing problem is to adjust the fine tuning on your television (most TVs have a ring around the channel selector). Or try flipping the switch on the RF modulator which selects between channel three and channel four.

Some TVs will produce a buzzing sound when certain color combinations are used. This is largely due to the video signal from the computer bleeding into the audio channel. To stop this, you could take your TV to a technician, and have him add a filter which might remove the video interference.

Another way to solve this problem is to purchase a Commodore 1701 or 1702 monitor. With this monitor, you can feed the audio and video signals separately. This helps eliminate that annoying buzz.

Jumping Screens Update

In the July issue, you dealt with a problem that many of us VIC users face. That is the apparent incompatibility of the VIC-20 and the Zenith System III TVs. You mentioned a minor hardware modification for the TV that would solve the jumping screen problem.

I initially experienced the same problem, but found a simple software solution. The jumping screen is apparently caused by a problem with the vertical sync, but it is not necessary, as you mentioned, to unplug the 2H vertical jumper, as suggested by the Zenith dealer.

If you turn on the interlace mode by either:

```
POKE 36864,PEEK(36864)OR 128
```

or

```
POKE 36864,133
```

the video signal is sent only 15 times per second, rather than the normal 30. This slower video refresh enables the vertical sync to function properly.

Dr. Philip C. Withers

Thanks for the helpful tip, Dr. Withers. Readers should note that it is bit 7 (value of 128) which controls the interlace switch. Bits 0–6 control the horizontal location of the screen. By POKEing different values to 36864, you can make the whole screen move back and forth. The next memory location, 36865, controls the vertical location. POKEing 36865 makes the screen move up and down. These two locations can be helpful in centering the screen. Also, if you're writing a game, a series of quick POKEs to these two locations can make the screen appear to "tremble," as if shaken by an explosion.

1520 Printer/Plotter Replacement Pens

As a recent purchaser of a Commodore 1520 Printer/Plotter, I have found that replacement pens are hard to find.

For interested readers, I suggest using the replacement pens for the Radio Shack PC-2 Printer/Plotter, catalog number 26-1480 (3 black pens), and catalog number 26-1481 (one each of red, blue, and green). The pens are identical to the Commodore pens.

Herbert H. Starkey

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Colorful Sprites

How do you give a sprite more than one color?

Scott Senkeresty

Sprites are a powerful programming tool, but with power comes complexity. You have to work out the shape, convert it to DATA statements, POKE them into a safe area of memory, set a pointer to the sprite shape, set X and Y coordinates, set the color, and turn on the sprite. There are a number of books and magazine articles which explain how to use sprites.

Multicolor sprites give you more flexibility, more interesting shapes to work with. If you've arrived at the point where you can define sprites and move them around the screen, you can begin to experiment with color. There are two ways to make multicolor sprites.

The first is fairly easy. Define two sprites, using different colors, and put one on top of the other. Sprites are displayed in a certain order of priority, from lowest number to highest. This means that sprite zero will always appear on top of (or in front of) all other sprites. Sprite one has priority over sprites two through seven, and so on.

Normally, if a bit is turned on, it will appear on the screen in the color of the sprite. An off bit will let the background color show through. But if you have one sprite on top of another, the off bits will let the second sprite's color show through (the second sprite is the one with the lower priority). As long as they have the same X and Y location, it will appear that you have a single two-color sprite.

There are two drawbacks to this method, however. The first is that instead of eight one-color sprites, you are limited to four two-color sprites (or two four-color sprites). Second, if your program needs to check sprite collisions, you have to be careful that the bits of the overlapping sprites do not intersect. You may get spurious collisions if the program is written in BASIC.

A better way to make colorful sprites is to use multicolor mode, controlled by a register at 53276. The eight individual bits correspond to the eight different sprites. To make all sprites one color, POKE 53276,0. POKEing a 1 makes sprite 0 multicolor (and the rest one color); POKEing a 2 makes sprite 1 multicolor, up to 128 which affects sprite seven. POKE 53276,255 (255 is 128+64+32+16+8+4+2+1) to make all of them multicolor.

Multicolor mode gives you up to 4 different colors in each sprite. The four colors are: screen color (actually a transparent part of the sprite allowing the background screen color to show through), individual sprite color, sprite multicolor 0, and sprite multicolor 1. The individual sprite color can vary from sprite to sprite, but screen color, and the two multicolors are the same for all eight sprites. The registers to POKE are as follows:

00 Screen color : 53281
10 Sprite color : 53287–53294 (sprites 0 through 7)
01 Multicolor 0 : 53285
11 Multicolor 1 : 53286

To turn on the multicolor mode for a single sprite, POKE 53276,PEEK(53276) OR (2↑ N) where N = sprite number (0 to 7). To turn off the multicolor mode: POKE 53276,PEEK(53276) AND (255−2↑N).

Unlike the first method of adding color, multicolor mode lets you have eight different sprites moving around. But there is one drawback: Resolution is halved. Instead of coloring individual pixels, pairs of pixels are turned on or off. Let's say one of the DATA statements is 50, which translates to a bit pattern of 00110010. With one-color sprites, the 1's would represent pixels which are turned on. But in multicolor mode, you have to look at bit pairs: 00, 11, 00, and 10. The first two pixels (00) would be transparent, the same color as the screen. The next two (11) would be multicolor 1, followed by the screen color again. The last two (10) would both be the sprite color. Even though the two bits are different, 1 and 0, the corresponding pixels would be the same color. Instead of each byte controlling eight different pixels, each byte controls four different pairs of pixels. C

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Mitey Mo is the complete—and affordable—telecommunications system for your Commodore 64. It will open up a world of practical and exciting uses for your computer, and it will take you online faster and easier than anything else you can buy.

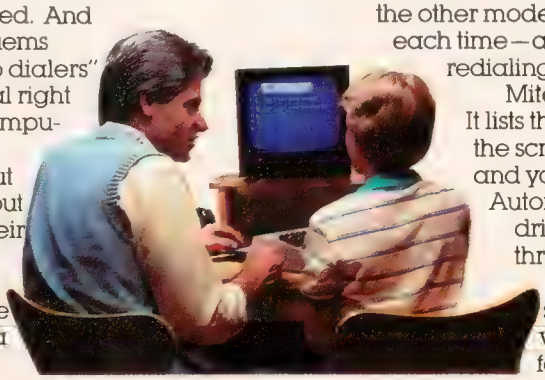
Now you'll be able to send and receive electronic mail, link up with community bulletin boards, play computer games with people in distant places, do electronic banking, and tap into library resources to find the material you need for your reports. All at your convenience.

Until Mitey Mo, Commodore's 1650 Automodem was the obvious choice when you went looking for a modem for the C-64. Like Mitey Mo, it has "auto-answer"— it receives data while unattended. And both modems are "auto dialers"—you dial right on the computer's keyboard. But that's about where their similarity ends.

Suppose you dial a number,

MODEM FEATURES	MITEY MO	COMMODORE AUTOMODEM
Auto Dial	YES	YES
Auto Answer	YES	YES
Auto Redial	YES	NO
Smooth Screen Scrolling	YES	NO
Both Cassette and Diskette Software Included	YES	NO
Menu Driven	YES	NO
24K Software Buffer	YES	NO
Function Key Template	YES	NO
Printing Capability	YES	NO
Easy-to-Use Manual	YES	NO
Bell 103 Compatible	YES	YES
Multiple Baud Rates	YES	YES
Dual Cables Included	YES	NO
Single Switch Operation	YES	NO
Warranty	3 years	90 days
Suggested Retail Price	$99.95	$129.95

Some mighty interesting features—ours and theirs. Yours to decide.



and you find that it's busy. Mitey Mo has "auto redial"—it hangs up and redials immediately until it gets through. With the other modem you have to redial each time—and somebody with auto redialing can slip in ahead of you.

Mitey Mo is menu-driven. It lists the things you can do on the screen. Select a number and you're on your way. Since Automodem isn't menu-driven, you'll be hunting through the manual a lot.

Mitey Mo has only one switch, the customized software does the rest. Every family member will find it easy to use. With the other modem you'll have to remember to check three switches, otherwise you may be answering when you mean to be originating.

Mitey Mo gives you access to twelve pages of memory (24,000 bytes), so you can store data and review or print it later. The other modem doesn't let you store or print anything.

Mitey Mo is half the size of the other modem. The very latest technology allows miniaturization and increased reliability, as well. Mitey Mo is so reliable, we gave it a three-year warranty. The other modem gives 90 days, then you're on your own.

Not only will you find Mitey Mo mighty useful, you'll find it mighty reasonably priced—$99.95. When you consider how much more you get, there's really no other choice.

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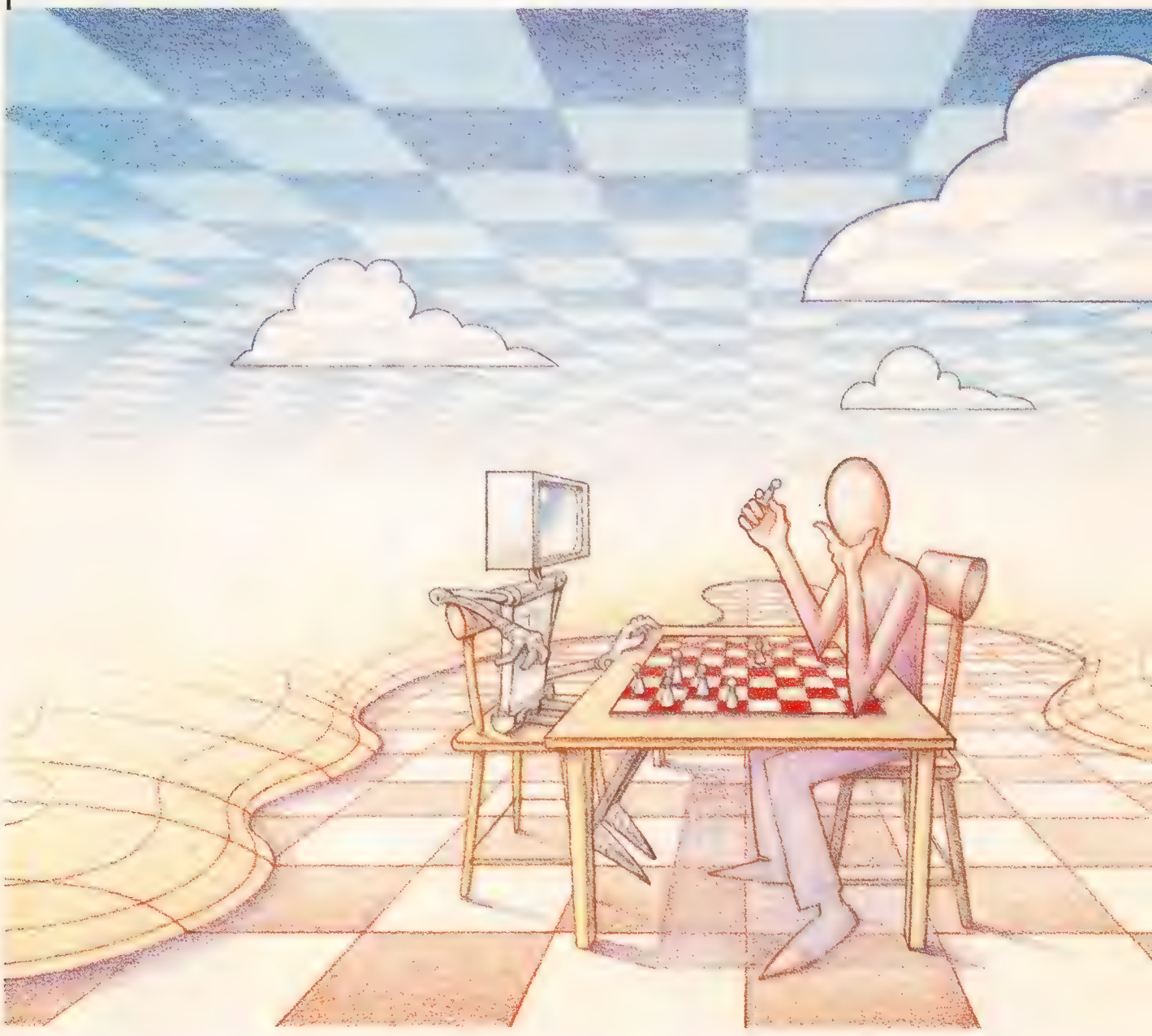
What If...?



The Popularity Of Strategy Games

Selby Bateman, Features Editor

From the ancient games of Chess and Go to modern simulations of business, sports, and warfare, strategy games enthrall us with their complexity and depth. Computer-based strategy games, many of which are available for the Commodore 64, are now coming into their own as sophisticated interactive simulations—the next best thing to being there.

Shall...we...play...a...game?

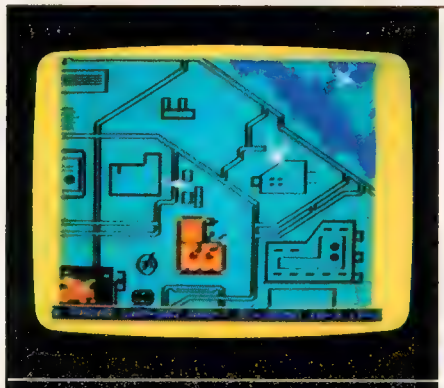
With that simple question, a supercomputer challenged a teenage computer hacker in the motion picture, *WarGames*. Audiences across the nation were fascinated as the game, *Global Thermonuclear War*, turned from simulation to movie-reality.

Similar computer strategy games are available in quantity for Commodore owners, and many more are in the works. Their complexity may not rival the one played by the mainframe supercomputer in *WarGames*, but they are remarkably advanced.

Game manufacturers have discovered that computers can bring to the traditional board strategy game three important components: flawless manipulation of hundreds of details, real-time action, and almost limitless variations of game play. The computer also helps to solve two of the traditional complaints about (non-computer) strategy games: They're too slow and they lend themselves to careless human errors in game bookkeeping. Some board war games involve dozens of individual units, with factors for troop movement, terrain, zones of control, morale, reinforcements, weather, and the list goes on. In some of these games, it may take an hour (or more) just to make one move.

"You're going to see even more detail and a lot faster speed in the games," says Joel Billings, president of Strategic Simulations, Inc. (SSI), a company which makes more than twenty computer-based strategy games for the Commodore 64.

"One of the problems we've been working on for five years—and it's getting solved—is that the games started out too slow. People didn't want to get into the [strategy] games on the computer because they saw

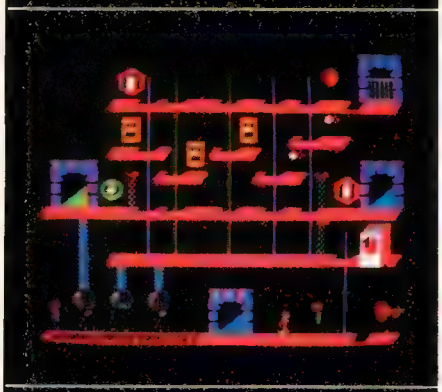


RAID ON BUNGELING BAY™

When you shopped for a computer, you wanted one with a lot of intelligence. This game may lead you to regret that choice, as your friendly little computer becomes the brains behind the most fantastic enemy you will ever face: The War Machine.

A monstrous artificial intelligence directs an endless army of self-replicating robot weapons and a complex of factories hidden on six heavily defended islands. Even as you strike at one island, robots beyond your field of vision continue to multiply...to repair the damage you've done...to attack and destroy.

Before all of Humankind is crushed beneath the Bungeling Empire's iron heel, one faint hope remains: you in your helicraft.

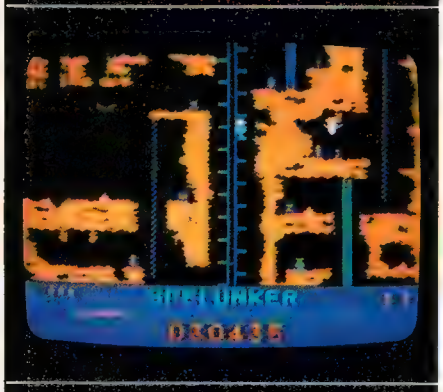


THE CASTLES OF DOCTOR CREEP™

Ever dream that you were locked in a haunted castle, wandering blindly through darkened corridors, never knowing what ghastly demons await you? Then you'll feel right at home in *The Castles of Doctor Creep.*

It's a maddening maze of 13 separate castles, more than 200 rooms in all. Sinister surprises await you behind every door: mummies and monsters, forcefields and death rays, trap doors and dead—*very* dead—ends. Remember where you've been and watch where you're going...there's got to be a way out *somewhere*!

Better hurry, or you'll wind up playing a rather unpleasant role in one of Doctor Creep's experiments.

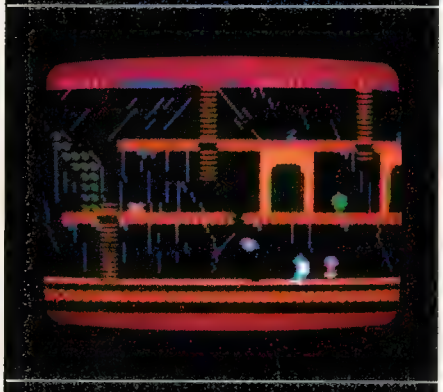


SPELUNKER™

Who knows what fabulous treasures—and unspeakable dangers—await you in the world's deepest cave? This is one game you can really get into... and into...and into.

Wander through miles of uncharted passageways, swinging on ropes and ladders, tumbling over subterranean falls and plunging to the very depths of the earth on an abandoned mine railroad. Deadly steam vents and boiling lava pits threaten you at every turn. Chattering bats and the Spirits of dead Spelunkers beg you to join them, permanently.

Let's face it: you're in deep, deep trouble.



WHISTLER'S BROTHER™

You're the star of a full-fledged arcade adventure—and the big question is whether it'll turn out to be a comedy or a tragedy. That's because your co-star and beloved brother, Archaeologist Fenton Q. Fogbank, is rather absent-minded and extremely accident-prone.

As you search for priceless treasures in steaming tropical jungles, ancient cliff villages, musty old tombs and glittering crystal caverns, you control both your character and your brother. The only way to keep him on track and out of trouble is to whistle and pray that he follows you to safety.

Poison arrows, runaway boulders, fearsome frogs and mysterious mummies are only a few of the hazards that'll make you wish you weren't your brother's keeper.

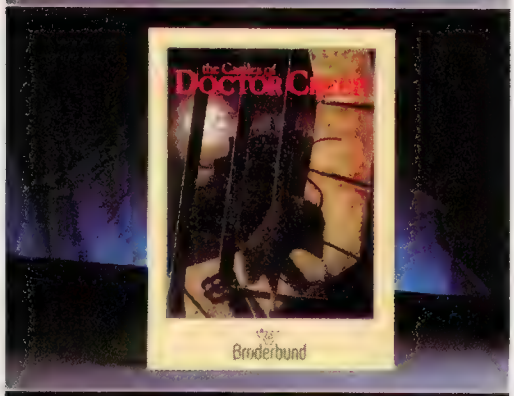
STEALTH™

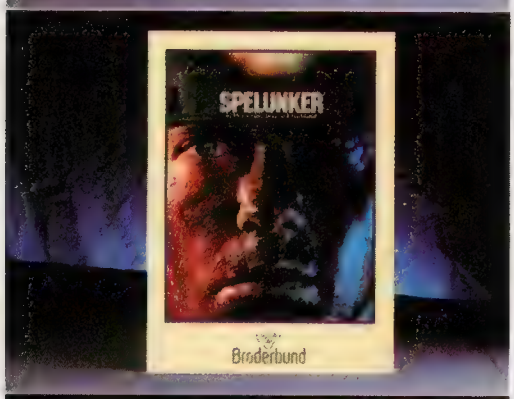
You're all alone on a strange and forbidding planet. On the distant horizon, looming thousands of meters above the blasted landscape, lies your destination: The Dark Tower, home of the mysterious Council of Nine, cruel overlords of a conquered world.

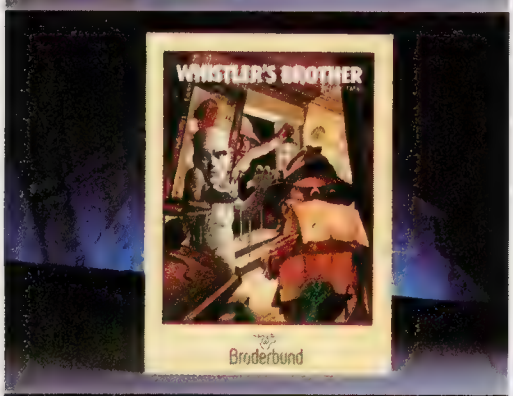
You must maneuver your Stealth Starfighter through an unending assault by the Council's automated arsenal—jets and heat-seeking missiles, photon tanks and anti-aircraft batteries, vaporizing volcanoes and deadly energy fields. Outgunned and outmanned, you must press ever onward, with only your stealth to rely on.

You must reach the Tower. You must destroy it. There's no turning back.

All titles available on Commodore 64. Championship Lode Runner *also available on Apple II+, IIe, IIc.* Whistler's Brother, Spelunker *and* Stealth *also available for Atari Home Computers. Commodore 64 is a trademark of Commodore Electronics, Ltd. Apple is a trademark of Apple Computer, Inc. Atari is a trademark of Atari Corporation.*

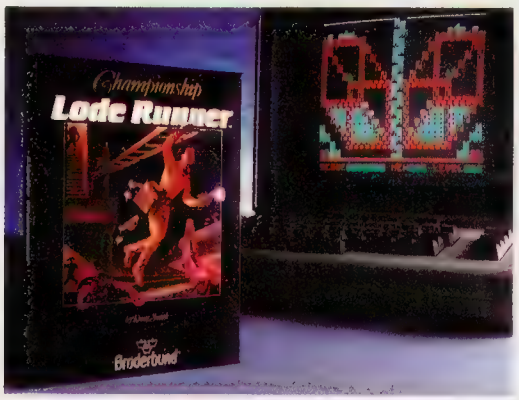






NO MERCY

FOR COMMODORE.™



CHAMPIONSHIP LODE RUNNER™

It has come to our attention that some of you out there think you're pretty good at *Lode Runner,* 1983's best computer game. For those foolhardy few, we offer a challenge of a higher order: *Championship Lode Runner.*

With fifty fiendish Treasury Chambers: more intricate, more elaborate, more insidious than anything you've seen before. You'll need lots of skill, lots of smarts, and every ounce of your lode-running experience to have any hope at all of survival.

And if you haven't yet paid your dues on the original *Lode Runner,* don't even think of attempting this championship round.

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them as very slow compared to hand-eye coordination games.

"That division between hand-eye coordination and strategy games is going to meld together; it's going to disappear," he adds.

SSI and Avalon Hill's Microcomputer Games Division offer more computer-based strategy games than any other companies, with scores of sophisticated simulations on a variety of topics.

A strategy game can be produced to simulate almost any activity. Naturally, the games that sell the best are those which intrigue the most people. Sports games such as baseball, football, boxing, bowling, and golf are all popular subjects of strategy games. Business strategy games also are popular: Manage your own multinational company, wheel and deal on Wall Street, or acquire and merge hotel chains. Avalon Hill even offers a game for the Commodore 64 which recreates a typical week in the lives of the "working class," *TGIF* (*Thank Goodness It's Friday!*).

Have you ever wanted to stage a 12-round fight between two of the great heavyweights, matching their individual strengths, weaknesses, and approaches as you manage the round-by-round strategy? What would a bobbing and weaving Larry Holmes have done against a heavy hitting Rocky Marciano?

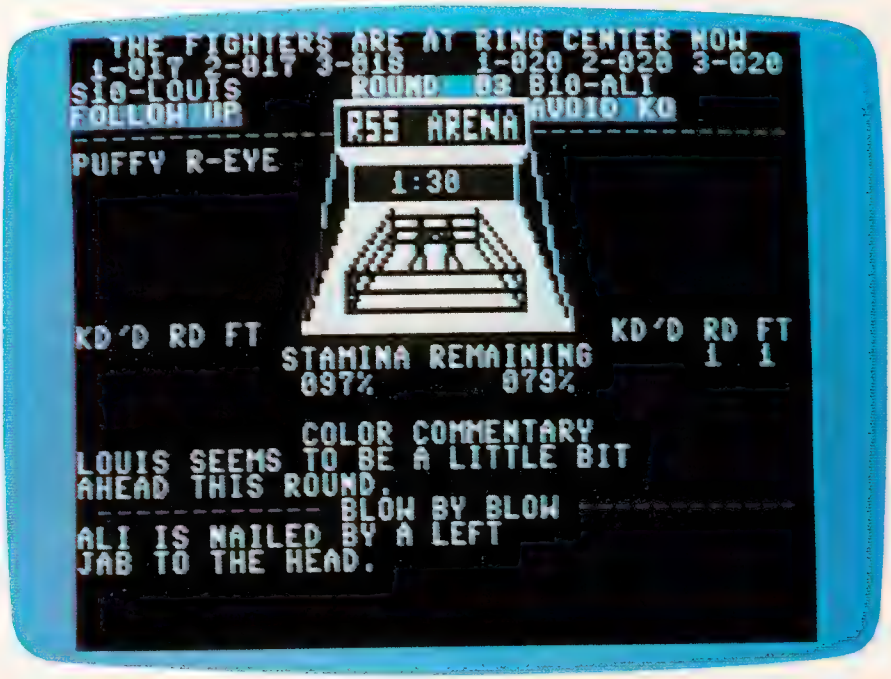
One way of designing a boxing game would be to concentrate on the fight, pitting one player against the other. It would be an action game where the two players control how much punching goes on. Each player takes on the role of a boxer. But suppose the players stepped back and took on the persona of a boxer's manager? It would no longer be a straight arcade-style game, because strategy and tactics would become more important than reflexes and reactions. You could give orders to the boxers, plan to start fast or slow, train your fighter in different ways, concentrate on offense or defense, and much more. The game would not involve twisting a joystick back and forth; you'd have to plan ahead.

SSI offers you the chance to do just that with its computer game of championship boxing, *Ringside Seat.* Choose your fighters and mix your own set of variables. If your fighter is a slugger, then he can probably charge in more effectively than a classic boxer who may be better at such techniques as sticking and moving. The options under your control are numerous. The computer, of course, does what it does best: keeps track of all those variables. That amount of detail would be almost impossible to monitor without the computer, and probably too boring for anyone other than the most tenacious game players.

This attention to detail brings not only more depth of play, but can offer months of continuing interest, notes Jack Dodd, director of marketing for Avalon Hill's Microcomputer Games. Game players seem more willing to pay a bit more for this extended play than for the kinds of arcade-style action games which may grow stale very quickly, he says.

Avalon Hill, which began producing board strategy games in 1958 with one title, now has more than 200 board, computer, and video games. Virtually all of the people now producing computer strategy games got their start playing Avalon Hill board games and the play-by-mail games that the company also helped pioneer.

While sports and business are topics for numerous games, the strategy of warfare remains as popular a game subject today as it was when chess was invented. Far more computer strategy games are devoted to studies of historical conflict than any other subject. Just as in *WarGames*, questions



SSI's Ringside Seat *offers more than 45 of the world's greatest fighters. The player plans round-by-round strategy and can alter each fighter's style, ability, speed, aggressiveness, strength, and many other characteristics.*

To teach your child to spell, we had to design software that talks.

Cave of the Word Wizard.™ A unique way to develop spelling skills using human speech and arcade action.

Software that tries to teach spelling by jumbled letters isn't a very good teacher. The software has to talk. Now it does. Only on *Cave of the Word Wizard* from Timeworks.

The Wizard talks like a human being, not like a robot. This fascinating character thrusts you into an intriguing adventure as he teaches spelling in the most effective way possible on a computer.

You have wandered into a mysterious cave, and the entrance has been sealed behind you. Suddenly the Word Wizard appears and informs you that in order to leave his cave you must find four magic crystals which have the power needed to open the cave entrance. You have only a flashlight to help you find your way through the cave, and your batteries are running low.

The Wizard is a funny old fellow who causes lots of mischief for anyone who enters his cave. He will appear often and ask you to spell a word—you will actually hear the old Wizard's voice!—and you cannot continue your search until you spell the word correctly.

The Wizard will use his magic powers to replenish the energy in your flashlight if you spell the word correctly, but each time you are wrong he will draw energy from your light. When your flashlight runs out of energy you will be doomed to roam through the cave in darkness forever.

During your search you will be confronted with spiders, rocks, snakes, and other dangerous obstacles that will make your quest for freedom even more challenging.

This state-of-the-art educational program includes 500 spoken words in 10 spelling skill levels and makes full use of the sound capabilities of your computer. The Wizard will talk to you in clear human speech. No additional hardware is needed for your computer system.

Only Timeworks offers *Cave of the Word Wizard.* Now at your favorite dealer. Or contact Timeworks, Inc., 405 Lake Cook Road, Deerfield, IL 60015. Phone: 312-948-9200.

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of "what if....?" are providing fascinating games for thousands of Commodore owners.

What if you commanded Caesar's legions against Helvetii barbarian infantry and Belgae cavalry during the Gallic Wars?

What if the Huns, who actually swept through Europe 400 years after Caesar's time, had been met by Caesar himself? Avalon Hill's *Legionnaire* for the 64 offers you the chance to find out.

What if you commanded the German troops invading Russia during World War II? Let your computer move the Russian troops in this campaign which was so crucial to the outcome of the war. Ba'rac Limited allows you to do just that in its new *Road To Moscow: The Eastern Front, 1941–45*, available for the Commodore 64. That's also the scenario in Avalon Hill's *Panzers East!*, for the 64. (See reviews of Ba'rac's *Road to Moscow* and Microprose Software's *NATO Commander* elsewhere in this issue.)

The Battle of the Bulge, another important engagement during World War II, is the subject of SSI's *Tigers in the Snow*. As in most war games, you make your strategic plans based on such factors as troop strength, weather, supplies, airpower, reinforcements, and similar categories.

Critics of these games deplore the attention given to the subject of war. SSI's Billings disagrees.

"War games make you a little more sensitive to the fact that war is not great. Seen from the eyes of the general, it may seem like a lot of fun. But you quickly realize it's very easy to say, 'I'm going to sacrifice this guy over here. It represents 15,000 men, but it's for the greater good.' Then you realize you wouldn't want to be one of those men out there being sacrificed," he says.

Those people who play strategy war games, adds Billings, generally are college educated, interested in history, and have fairly high IQs. "It's an awareness level. People who play war games are more aware of the issues. There's a better understanding of what's going on," he says.

"I don't think you have any more of the jingoistic type of feeling. You probably have less of what you might think would be associated with war games," says Billings. "Studies of the war gamer crowd ten years ago showed that you're dealing with college educated people, and that's why it fits in real well with computers, of course. [The games] are very complicated; you don't play them unless you're pretty smart."

Whatever the pros and cons, it's clear that war strategy games have found a natural habitat in the computer.

Billings says the audiences for computer war games and other strategy games, such as sports or business, are different. From customer response cards, SSI knows that 95 percent of the people who buy their computer war games have played board war games by Avalon Hill or others. Of the customers who purchase SSI's *Computer Baseball*, Billings says that 62 percent have played a board war game before. "So, you're getting 40 percent of those people who are not wargamers, but happen to be interested in baseball. They don't know what a strategy war game is," he says.

SSI is trying to reach that percentage with several of its new games, which feature realtime action. With games like *Combat Leader*, which includes arcade-style graphics and action as well as strategy, and *Broadsides*, which puts you in command of an 18th-century warship, realtime action is used to make the game more interactive. Realtime action allows both sides to move virtually simultaneously. Changes even occur off the screen while the game is in progress, adding a more realistic feel.

"In most war games, you sit down and make your move. Then the other player makes his move, and so on. In *Combat*

Among the most popular computer strategy games are simulations of important battles and wars, such as Avalon Hill's Dnieper River Line.

/"Hi, we're from Europe. Where's the gold?"/

A SECOND CHANCE *to* GET *the* NEW WORLD RIGHT.

IF COLUMBUS HAD LANDED IN NEW JERSEY; if Cortez had been nicer to Montezuma; if Pizarro had been a more generous soul, would the world today be any different?

If you've ever wondered about things like that, you'll like *Seven Cities of Gold* very much indeed.

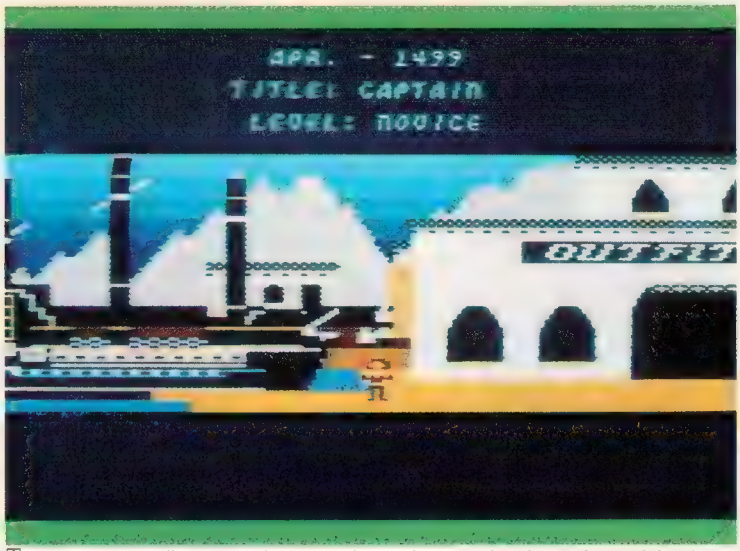
It's a kind of adventure. An unusually rich and technically impressive one with new continents to explore, natives to encounter, resources to manage and trade routes to establish. But beyond all the neat stuff *Seven Cities* throws up on the screen, there's something else happening here.

It feels quite odd to look at the map and see nothing. Of course you have to explore the more than 2800 screen new world in order to map it. But the way the natives act, the way you get older, the way seasons change and your men behave, and the way your reputation preceeds you gives you a sort of feeling that's unexpected in computer games. It's deeper. Maybe a little disquieting. It plays as much in your head as it does inside your computer.

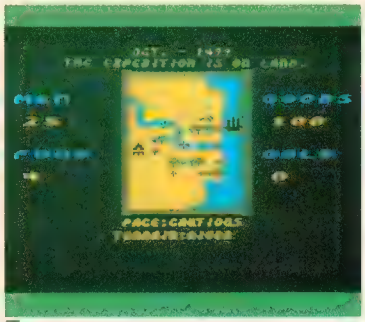
Seven Cities does all this with the real world or, better still (since the "new" world really isn't anymore), it will construct any number of completely detailed hemispheres for you to try your hand with.

Designed by Ozark Softscape (the people who made M.U.L.E., *Infoworld's* "Strategy Game of 1983"), *Seven Cities* is about as near a recreation of history as has ever been accomplished, with or without a computer.

Find it. Stomp around in it. See if you can't do a better job than all the celebrated figures who got us into the mess we have to deal with today.



This is Europe, in scrolling 3-D graphics. You outfit, visit the Crown, launch your ships, and if you're cut out for this, you return later to tell all sorts of wild stories about what it's like over there.



There are over 2800 screens to explore in the new world. As you scroll through them, seasons change.

Animated natives surround you. They have no reason to trust you. The drum beat quickens.

Trading with the Aztecs is tricky. You could wind up with enough gold to build an empire. Or as soup

Home again you view your maps, pat yourself on the back, and consider your place in history.

SEVEN CITIES *of* GOLD™

from ELECTRONIC ARTS™

MACHINE REQUIREMENTS: *Seven Cities of Gold* is available for the Apple II, II+, IIe & IIc, Commodore 64 and Atari home computers.

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Leader and *Broadsides*, it's all realtime, so it has the feeling of an arcade game. But it has a lot more strategy built in than an arcade game would have," he says.

Computer strategy games, while already complex, will become even more interactive and sophisticated in the future, says Roger Damon, who designed Brøderbund Software's popular *Operation Whirlwind*, available for the Commodore 64.

"There are just so many possibilities. It's amazing to me that people haven't explored them," says Damon. "When you get into the next generation of computers, some really incredible simulations are going to start coming along."

A battle action set during World War II, *Operation Whirlwind* depends more on strategy than on force as you attempt to move your infantry battalion forward against an enemy-held city. The game was Damon's first computer-based strategy simulation. He's now completed a second game, *Field of Fire*, for the 64, which is being marketed by SSI.

"I dropped down in scale, so that it's no longer companies you're moving around. It's actually fire teams—just small groups of men," says the 34-year-old programmer. "And then it went on from there. The graphics improved. I could make houses look more like houses, and actual blocky looking figures on the pieces instead of military symbols."

In the game, your goal is to take your company of men through a sequence of World War II scenarios that starts in North Africa, goes through Sicily, takes you to the beaches of Normandy, and then into Germany.

"You try to survive with these guys. There's actually a role-playing element where you can name your own characters. And as they survive the scenarios, they improve," adds Damon.

Avalon Hill's *T.A.C.* (*Tactical Armor Command*) also brings war strategy games down to the unit level. You have control over individual tanks, anti-tank guns, and infantry squads in this World War II scenario. You build your own combat team from among 40 different armored vehicles representing four of the major powers of World War II. Because of your computer's ability to handle the minutiae of detail, many variables can be included: range, armor thickness, respective speeds and maneuvering capability, visibility, and much more. Even the placement of the fuel tank on a given tank can be a crucial factor easily accounted for by the computer.

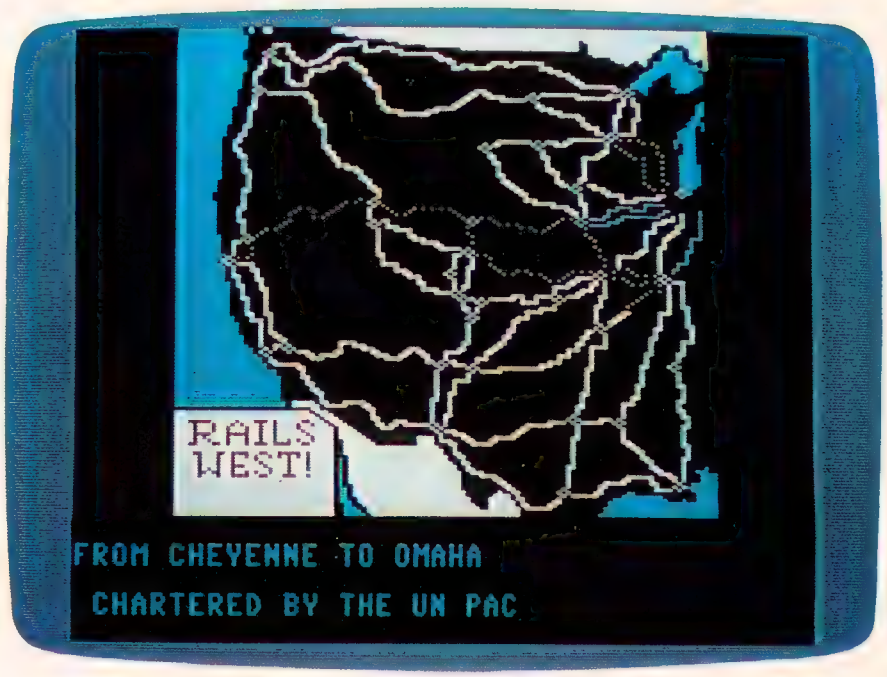
Computer strategy games are already beginning to use more of the memory becoming available on high end computers. Avalon Hill's *Computer Diplomacy*, for example, is a strategy game full of high-level diplomatic intrigues set among the superpowers prior to the First World War. The game requires a 256K IBM PC to run. That's clearly the direction in which future strategy simulations will head as computers become more powerful.

But for now, Commodore owners are strategically placed to take advantage of some of the best such simulation games in the field.

While a number of software developers offer computer strategy games, these two companies produce such a variety that you may wish to send for their catalogs:

Avalon Hill Game Company
Microcomputer Games Division
4517 Harford Road
Baltimore, MD 21214
(301) 254-9200

Strategic Simulations, Inc.
883 Stierlin Road
Building A-200
Mountain View, CA 94042-1983
(415) 964-1353



SSI's Rails West!, *in which the player assumes the role of a railroad baron of the 1870s in an effort to build the transcontinental railroad system.*

[OH NO, NOT AGAIN.]

SON of ARCHON.

Jon Freeman, Paul Reiche III and Anne Westfall created Archon, the 1983 "Game of the Year" according to Softline and Creative Computing. Recent evidence, however, indicates they were not satisfied with this

If you took all the hours spent by all the people who've played Archon and put them together, there's a good chance it'd amount to more human effort than it took to put a man on the moon.

The Archon Dragon.

What does this mean? Is it a good thing? And why, in light of this, did the people pictured here decide to issue a scorching sequel named *Archon II: ADEPT?*

For starters, we don't really know what it means. Except that a lot of people who had a pretty good time with *Archon* are about to get more of what they like. And people who've yet to experience the best-selling, award-winning, knuckle-whitening original have *two* good things coming their way.

The Archon Basilisk.

Point two: If there's a moral issue here, we see it this way: A wise man once said, "I ain't never had too much fun." We agree. And we think that once you get your hands on *Archon II: ADEPT,* you'll see his point.

Now for the third question. Why a sequel? Well, there are sequels and there are sequels. The good ones happen because people just haven't had enough of a good thing. Obviously we're here to tell you that *Archon II: ADEPT* falls into the right category.

The ADEPT Chimera

Where Archon took inspiration from chess, fantasy role-playing characters and arcade combat, *ADEPT* comes more from a world of its own making. Like *Archon,* it pits the forces of good against those of evil. But in place of the chessboard motif there is a map of elements—Earth, Air, Fire and Water. The role of magic is greater. The strategies are deeper. Things move faster. And the hidden algorithms that control the computer's play are considerably smarter.

The ADEPT Thunderbird.

Having already spent the better part of a month playing *ADEPT* (in order to write this ad, of course), we're quite confident it will seduce you too.

And if, by some strange chance, there is a parallel universe in which computer simulations come to life, we are confident that a large part of its population has Jon Freeman, Paul Reiche III and Anne Westfall to thank for their brief and miserable existence.

ARCHON™ & ADEPT™

from ELECTRONIC ARTS™

MACHINE REQUIREMENTS: *Archon* is available on the Apple II, II+, IIe & IIc, IBM-PC, PCXT & PCjr, Commodore 64 and Atari *Archon II: ADEPT* is available on the Commodore 64 and Atari

Archon and *Archon II: ADEPT* are registered trademarks of Electronic Arts, Inc. Atari is a trademark of Atari Computer Corp. Apple is a trademark of Apple Computer Corp. Commodore is a trademark of Commodore Business Machines, Inc. IBM is a trademark of International Business Machines, Inc. For a free product catalogue, send a stamped self-addressed #10 envelope to Electronic Arts, 2755 Campus Drive, San Mateo, CA 94403

CHESS: A "Combinatorial Explosion"

The ancient game of chess provides a good example of the way in which computer strategy games work. It also reveals the allure that such strategy games have had for computer scientists and programmers from the beginnings of the computer era.

When mathematicians first began to think of ways to test the abilities of computers, chess seemed ideal for several reasons. First, the rules are explicitly defined and limited; second, a computer's chess play can be easily compared and measured against that of a person's; and third, there is no one correct answer, only a constantly changing series of positions which the computer must continually analyze and reanalyze.

The 19th century inventor Charles Babbage theorized that games like chess and tic-tac-toe would be excellent indicators of how successfully an "analytical engine"—that is, a computer—could mimic human thought. Today, computer chess programs have been written which rival the strength of very good players; although even the strongest computer chess game is not yet superior to the world's best chess grandmasters.

Microcomputer chess games like *Sargon II* from Hayden Software (600 Suffolk St., Lowell, MA 01853) and *Chess* from Odesta (3186 Doolittle Drive, Northbrook, IL 60062)—both available for the Commodore 64—offer varying levels of play, demonstrations of moves and strategies, and other options that the first mainframe computers could never have included.

Translating Strategy To Numbers

In order to function, chess programs must assign numerical values to each chess piece. The lowly pawn might be assigned a one, for example; the queen, a nine; and the indispensable king, a number high enough to discourage the computer from ever risking its capture. Advanced computer chess games also consider values assigned to certain positions on the board as well—the center, with its variety of possible moves, being generally better than a corner position or one along the side of the board.

Using a trial-and-error method, computer chess programs search every possible move and countermove, calculating numerical totals based on pieces captured or lost in subsequent combinations of moves.

If a computer, even a supercomputer, were asked to consider without limit each combination from the first move in a game of average length (say forty moves), what would occur would be a geometric progression of possible games—a virtual combinatorial explosion—which has been calculated at something like one million to the twentieth power, or a one followed by 120 zeros. Computer chess programmers can build in routines, however, which will limit the number of moves a computer will analyze per turn. Other techniques can be applied in chess programs which will diminish even further the total number of combinations needed to be considered by the computer to those which apply directly to a given situation.

All strategy games use some variation of this basic formula, but with additional complexities built in. There are no random elements in a game of chess. But in many of the most popular strategy games, there are such variables as weather conditions, fatigue factors, supply problems, and even troop morale fluctuations which may influence the outcome. In this way, strategy games can more accurately simulate the random elements of real life than does the game of chess.

Instead of the computer having to keep track of 16 pawns and 16 major pieces for both sides in chess, many strategy games require that the computer follow hundreds of different pieces, calculate time and strength differences, introduce random elements, and figure dozens of other variables. In the final analysis, whether the computer game is chess or the most complex simulation of business, sports, or war, the same numerical value system is at the heart of them all.

IT'S HERE

COL

INTRODUCING OKIMATE 10... THE FIRST

The printer in a class by itself.

It's here! The new OKIMATE 10 Personal Color Printer. The first color printer that lets you show off and tell all. The printer that lets you print all the information you can create with your Atari® or Commodore® computer. But with the remarkable ability to create original drawings and graphics as well, in over 26 beautiful colors.

A class act! The OKIMATE 10 gives you crisp, clean term papers, school reports and homework. Word processing capability means everything you do can be printed letter quality in minutes, instead of typed in hours. OKIMATE 10 color gives you the opportunity to print graphs, charts and pictures from popular graphics and drawing programs. OKIMATE 10's brilliant color means you'll shine, every time.

OKIMATE 10 feels right at home. Anywhere.

A special PLUG 'N PRINT™ package lets you plug your new OKIMATE 10 into your Atari or Commodore computer. And print. It's that easy. In minutes you'll be printing everything from soufflé recipes to needlepoint patterns. Party invitations to kitchen inventory. Love letters to gardening directions. At 240 remarkable words per minute. And not just in black and white, but in over 26 brilliant colors!

Financial statements will keep you tickled pink for very little green.

If you use your personal computer to keep track of mortgage payments, tuition payments, balance your checkbook or jump ahead of the Dow Jones', there's good news for you. You'll find that the new OKIMATE 10 gets down to business quickly. And easily.

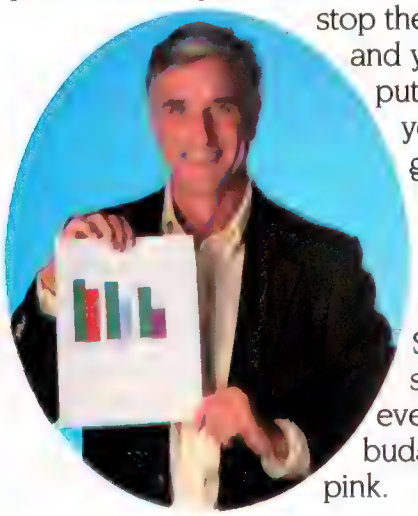
A "Learn-to-Print" diskette and tape shows you how to set up your new personal color printer and start printing. A complete OKIMATE 10 Handbook will show you how you can take your imagination to places it's never been before.

*Atari is a registered trademark of Atari Inc. *Commodore is a registered trademark of Commodore Business Machines, Inc.

.OR

PERSONAL COLOR PRINTER UNDER $250.

And while your imagination is soaring, you'll be glad to know that your new printer can keep right up with it! The new OKIMATE 10 is built with the same tradition of quality and manufacturing excellence that has made Okidata the most respected name in computer printers. Okidata craftsmen specially designed and engineered the new OKIMATE 10 to be incredibly small and lightweight. And they made it quiet as a whisper. But their imagination didn't stop there. To help you and your personal computer keep within your personal budget, they made the OKIMATE 10 available at retailers everywhere for less than $250. Something that should make every personal budget tickled pink.



Color your world.

If you've been playing games on your personal computer, now you can get serious and still have fun. The new OKIMATE 10 is completely compatible with a variety of software packages that will run on your Atari and Commodore with a simple disk drive. Just load and you're off and running. Plotting charts. Designing special graphs. Creating original illustrations and pictures. Drawing special graphics. And printing them all beautifully for everyone. On most kinds of paper. In over 26 beautiful colors!

QUESTIONS & ANSWERS

Q: Why do I need a printer?

A: You might as well ask, "Why do I need crayons?" When it comes to communicating, "putting it on paper" is still the best way to get your message across. You can have lots of computer equipment, but without the OKIMATE 10, it doesn't mean very much. Unless you get your letter, report, term paper or party invitation off the screen and down on paper, nobody's going to see it.

Q: What makes the OKIMATE 10 better than any other printer?

A: Because the OKIMATE 10 is unlike any other printer. First, it prints in COLOR. Up to 26 beautiful colors. Second, it prints up to 240 words a minute, so quietly you can talk in a whisper right next to it and still hear every word! And third, it prints letter quality, every time.

Q: What about graphics and pictures?

A: The OKIMATE 10 does it all. Graphs, charts, symbols, pictures, illustrations, and special drawings! With a compatible drawing package, anything you create on your screen can be printed in full color; a disk drive is required for color screen printing.

Q: What kind of paper can I use?

A: Just about any kind of smooth paper you want. From continuous feed computer paper to single sheets. From mailing labels to plastic acetate for overhead transparencies, the OKIMATE 10 prints crisp, clean, colorful images you'll be proud to send to friends, teachers, business associates, or frame and hang right in your own living room!

Q: Is the OKIMATE 10 easy to use?

A: As easy as "PLUG 'N PRINT!" No other printer is easier to use than the OKIMATE 10. Connecting the printer to your Commodore or Atari computer is, literally, a snap. The exclusive PLUG 'N PRINT package snaps into the printer. One cable connects it directly to your computer or disk/tape drive. Turn it on and you're in business. Once your OKIMATE 10 is up and running, the "Learn-to-Print" software program (included) teaches you printer basics—the "Color Screen Print" disk (also included) automatically prints everything on the screen in a single stroke. As a matter of fact, most of your printing can be done with just one command.

Q: What's the printer like in operation?

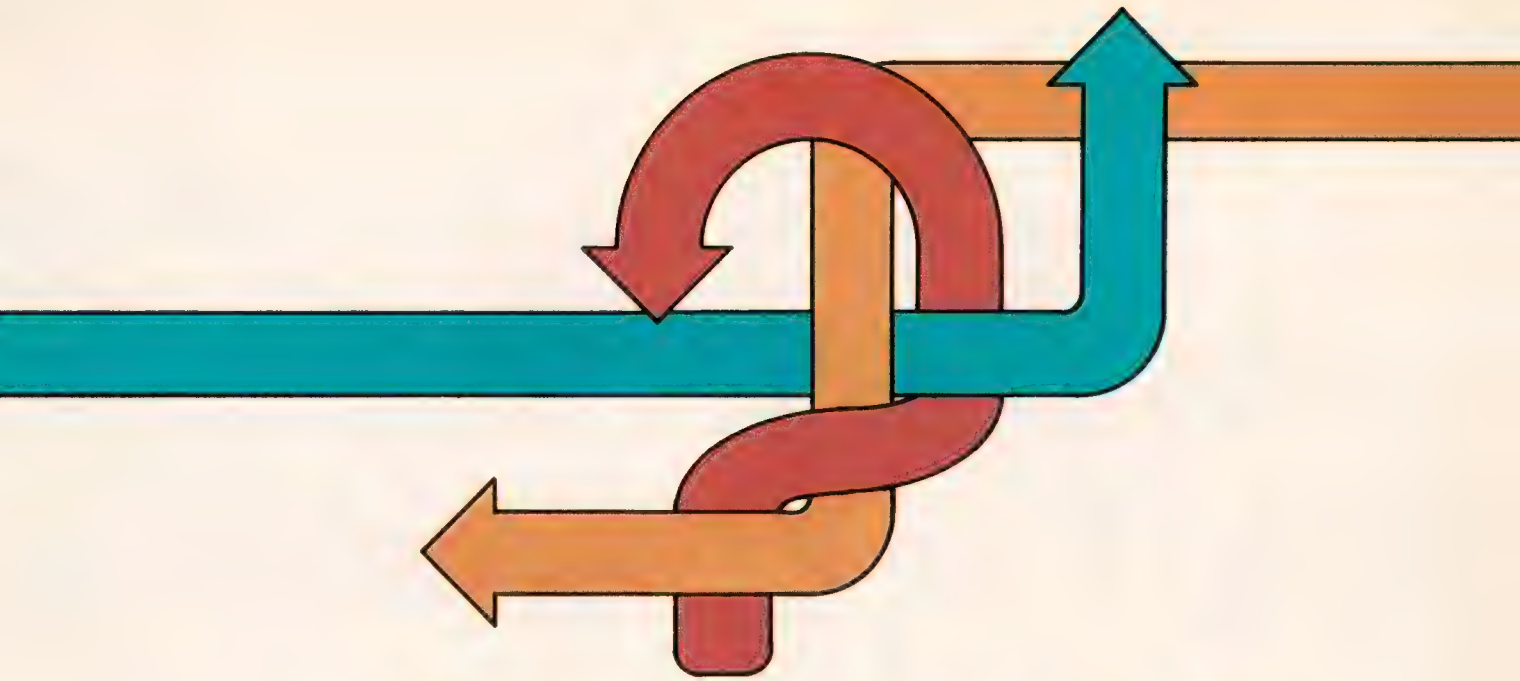
A: In one word: easy! Incredibly easy! The ribbon comes in a "Clean Hands" cartridge. So it's as easy to change as the tape in your audio cassette player.

Q: What about reliability?

A: Okidata has built the reputation of its complete line of printers on quality, dependability and rugged construction. The OKIMATE 10 is no exception. Don't let its light weight and compact size fool you. This printer is not a toy. It's a workhorse.

OKIDATA
an OKI AMERICA company

Available at retailers everywhere.



Electronic Trivia

Kathy Yakal, Feature Writer

Who was the first NHL player to earn $100,000 per season? What does a buffalo lack which a bison has? How many states border Tennessee? Trivia questions have fascinated and frustrated people for years. More recently, trivia buffs have been able to enjoy an explosion of new trivia board games. Many new trivia games are now available for the Commodore 64.

It seemed to hit last Christmas. Thousands of holiday travelers, returning from visits with relatives, had a new way to pass the time while making the long trek home. *Trivial Pursuit* had been under a lot of Christmas trees, and it was suddenly the hottest game since *Monopoly*.

Party guests who normally would have excused themselves early to avoid icy midnight winds found themselves staying well into the early morning hours at January parties. Everybody wanted to play, and manufacturers couldn't keep up with the demand.

Waiting lists for the wildly popular game stretched for pages. Store clerks, tired of constant queries, posted signs saying, "We are out of *Trivial Pursuit*."

Sales of *Trivial Pursuit* will reportedly reach $750 million in the United States alone this year. The entire board game industry took in less than half that amount in 1983: $310 million.

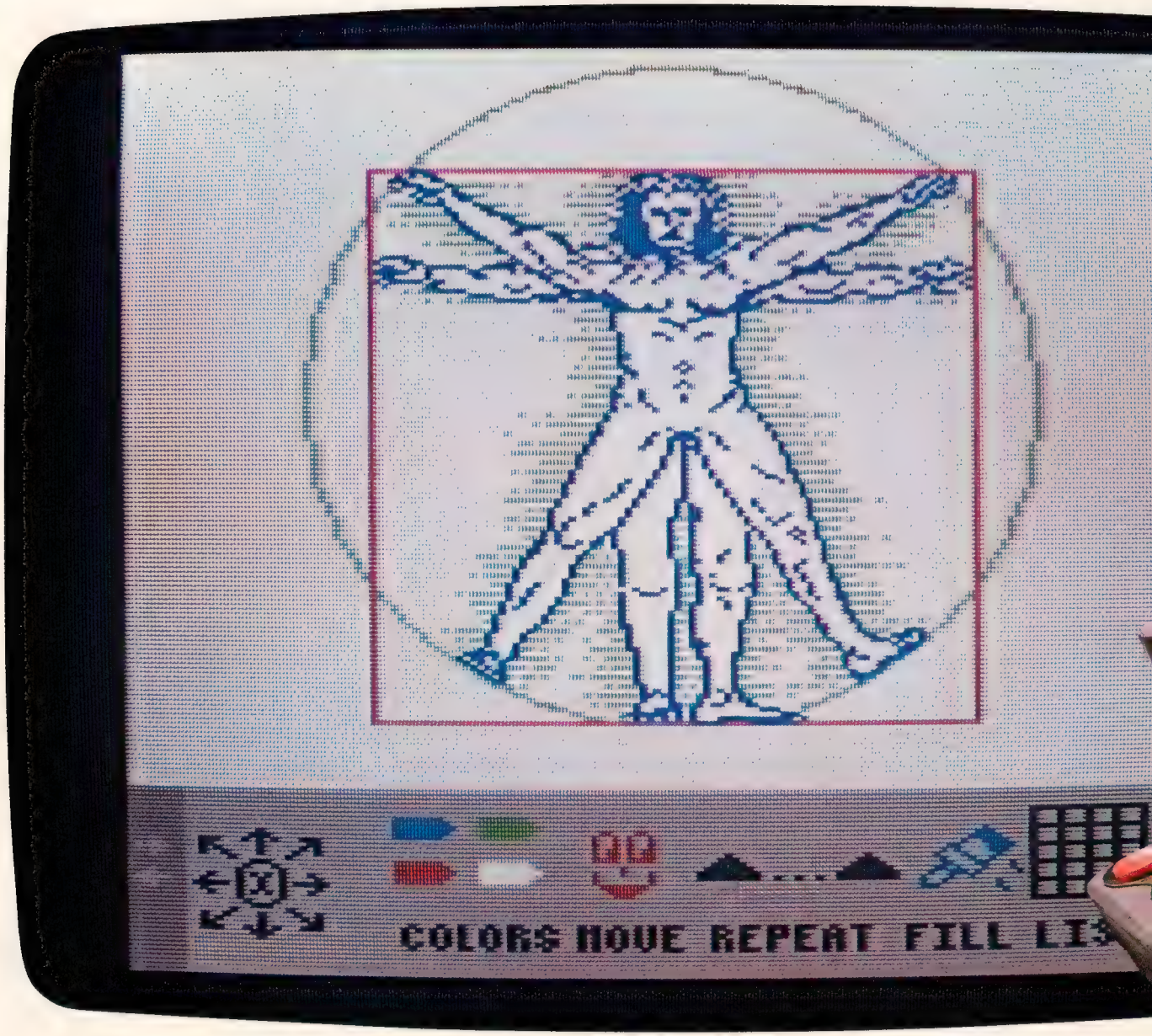
Monopoly, the best-selling board game of all time, may soon lose that title. It took 49 years for *Monopoly* to sell 85 million sets worldwide. *Trivial Pursuit* is expected to sell more than a quarter of that total in one year's time in the U.S.

This recent surge of popularity in a trivia game has spawned many clones. (There are even trivia board games sold by news magazines and television shows.) And at least a dozen Commodore 64 versions have sprung up in half as many months. Some are the products of familiar software publishers, but more than one company has formed for the sole purpose of supplying trivia games to home computer owners.

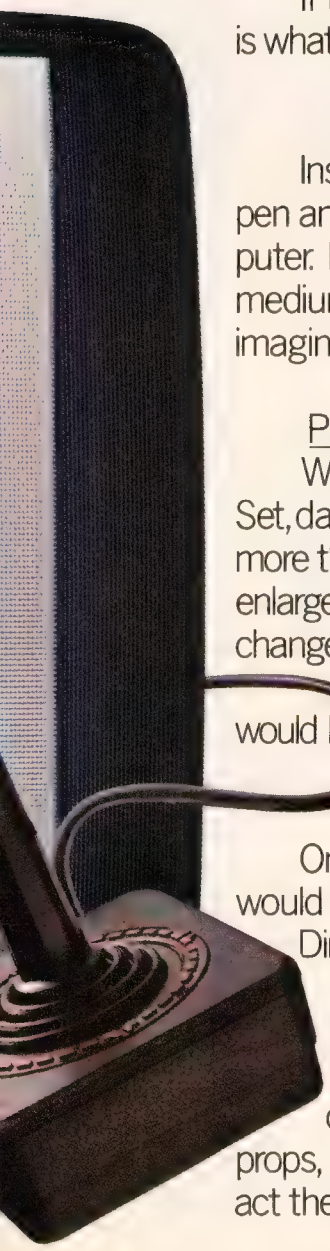
These games vary greatly in format. Some are multiple-choice, and require the players to enter the correct answer (via joystick or keyboard) before other players do, or before a time limit is up. Others supply the question but no hints; the correct answer is displayed after everyone has guessed. And at least one incorporates an arcade game format, giving players a chance to brush up on their hand-eye coordination as well as their memory.

Question categories vary, from such standard topics as television and movies, sports, and geography, to areas such as body language, antiques, and phobias. There's something for everyone.

Computer prog
da Vinci, Shakesp
Al Capp would ha



rams for kids that eare, Dickens and ve loved.



If they were starting out today, this is what they could start with. Pixelwerks.

THE OTHER WAY TO DRAW AND WRITE

Instead of a brush and canvas, a pen and paper, they'd create on a computer. Because Pixelwerks is the first medium that can keep up with their imaginations.

MR. PIXEL'S PROGRAMMING PAINT SET

With Mr. Pixel's Programming Paint Set, da Vinci (or any 8-year old) could do more than paint a picture. He could also enlarge it, repeat it, move it around, and change colors. Instantly.

And at the same time, he would be developing his programming skills. Painlessly.

SHOW DIRECTOR

On the other hand, Shakespeare would love to play around with Show Director.

He'd use it to create plots and think up one scene after another, and he'd get a big cast of characters, lots of backgrounds, props, and musical sound effects to act them out.

BANK STREET STORYBOOK

Dickens wouldn't be able to keep his hands off Bank Street StoryBook by George Brackett.

Not only could he write his own story, but he could also illustrate the scenes and characters he sees in his mind.

MR. PIXEL'S CARTOON KIT

Maybe Al Capp wouldn't be satisfied with cartoons that just sit on the page after he tried Mr. Pixel's Cartoon Kit. Because he could make his cartoons come to life by animating them. His characters could move around, and even react to each other.

Every kid has a touch of creative genius buried inside. The job of Pixelwerks is to bring it out, with more features, more options and more flexibility than other programs.

In short, we supply the tools. Kids supply the imagination.

PIXELWERKS

Pixelwerks is published by Mindscape, Inc., 3444 Dundee Road, Northbrook, IL 60062 For more information, call 1-800-221-9884. In Illinois 1-800-942-7315

Why the mania? "Trivia has been around for a long time, but we just haven't noticed it as much," says Doug Monahan, co-founder of a Dallas-based software company, Trivial Compute.

Monahan's point is well taken. TV game shows, dating from the early days of *The $64,000 Question* and *GE College Bowl*, to the recent revival of *Jeopardy*, have had people shouting answers from armchairs at home for years. In the pre-arcade game days, airports and other public places had coin-operated "test your knowledge" games. Monahan recalls heated verbal trivia matches in moments of boredom during his days at West Point.

"In the '60s, everyone was protesting. In the '70s, no one knew what was going on. Now, in the '80s everyone is conscious of living well," he says. "It's chic to drive a big car and know lots of stuff."

The latest in Trivial Compute's series of trivia games is the World Class Edition, focusing on the lifestyles of the rich and famous, international sports and resorts, royalty and celebrities. Questions range from "What city is Yale University in?" to "What is the name of the breed of the $2000 dog featured in the '83 Neiman-Marcus Christmas catalog?" and "What ski resort in America offers skiing in July?"

"What we're selling is information," says Monahan. He sees his move into the trivia game business as a natural progression from his years working with data base management systems.

Other editions available from Trivial Compute include *Trivia Americana, West Coast Trivia, New York Insignifica*, and *Texas Trivia*. They're in the process of completing a talking trivia game, which uses the Covox Voice Master, a speech synthesizer for the Commodore 64.

Also entering the trivia game arena is software publisher Screenplay. "Everyone has been asking trivia questions of each other for years, like 'What was the name of Sky King's airplane?' " says company president Sandy Schupper. "*Trivial Pursuit* started out the public awareness of trivia. We looked at the computer as a perfect medium, because not only does it give you the basics of a trivia game, but it gives you a little more excitement, using the computer's sound and graphics."

Screenplay's *Trivia Arcade* takes advantage of the Commodore 64's sound and graphics capabilities through its arcade game format. Before each question is displayed, players must chase down the figure representing the category they want. Each correct answer is rewarded with one of the letters in the word "trivia." Once a player spells out the entire word, he or she must answer a question correctly in each category to win.

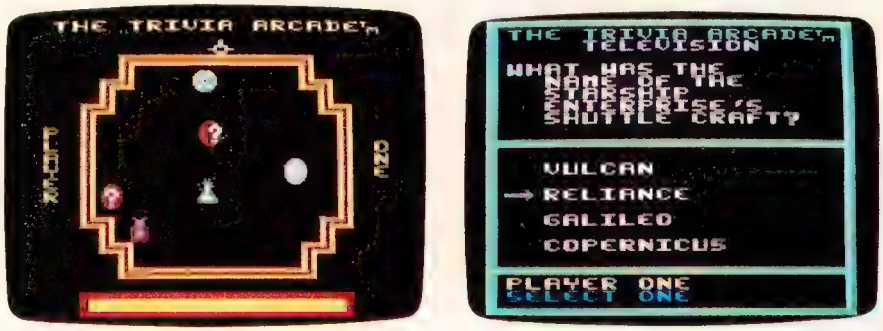
Trivia Arcade contains 3500 questions in five categories: sports, television, science, music, and general knowledge. Additional disks, containing up to 4000 questions each, will be available this winter.

Most of the trivia games currently available emphasize getting the right answer within a pre-determined time limit. Players take turns answering questions, and the winner is usually the person who obtains the prescribed amount of points first.

Suncom's *PQ: The Party Quiz* requires quick reflexes as well as the correct answer. The game comes with four hand controllers connected to cables that plug into the Commodore 64's two joystick ports. Each controller has four touch-sensitive pads on it. After the question and four possible answers are displayed, the first player to hit the correct button corresponding to the right answer on the screen gets points.

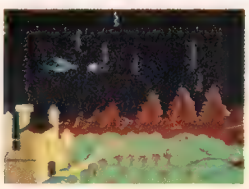
The game can also be played in *social*, as opposed to *competitive*, mode. Everyone who answers the question correctly within the time limit gets points. The faster you answer, the more points you get. Other user-controlled functions are response time (3–10 seconds) and game length (5–20 rounds; 10 questions per round).

Every few rounds, each player must take on the computer in a *lightning round*, where ten questions are displayed in 20 seconds. The more questions answered correctly, the more



Shoot down the character representing the category you want to choose (sports, music, television, science, or general knowledge), and answer correctly to win one letter in the word "TRIVIA" in Screenplay's Trivia Arcade.

DRAGONRIDERS OF PERN. FLY THE UNFRIENDLY SKIES.



Shooting down the menacing and constantly multiplying Threads isn't easy, but it's only one of the challenges in this official computer game version of Anne McCaffrey's famous book series.

Your strategy will be put to the test as you try to negotiate alliances with Pern's Lord Holders in an attempt to form the most powerful Weyr on the planet. Should you take a firm stance or compromise? Will asking a Craftmaster for assistance increase your chances for success? Maybe you should invite prospective allies to a Wedding or even a Dragon Hatching. Remember to check the Lord Holders personality traits first. It may be critical to your success.

Numerous screens combine to create truly unique and challenging game play. There's even a practice screen to sharpen your Thread Fighting skills.

If you liked the books, you'll love the game. After all, how often do you get the chance to actually fly a dragon?

One to four players, joystick and keyboard controlled.

EPYX™ COMPUTER SOFTWARE

Strategy Games for the Action-Game Player

bonus points awarded.

It's rather ironic that trivia is so wildly popular. School children despise tests. Even college students, interested as they may be in their chosen subject matter, tend to groan when finals come around.

Though labeling trivia games as "educational" might mean death to them in the entertainment market, the fact is that they *are* educational. We don't always retain the answers to all the questions we miss (although we certainly do if we miss them a second time), but we're often reminded of all the things we've forgotten since school days.

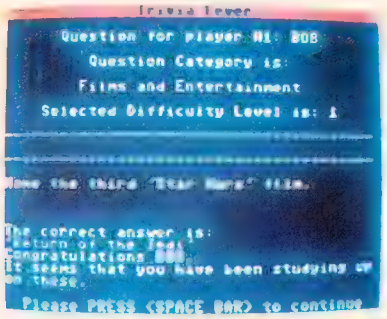
One trivia game that could easily be used in a classroom setting is *Trivia Trek*, by MMG Micro Software. The game contains 500 multiple-choice questions in ten different categories, ranging from antiques to inventors to U.S. statistics. There's even a section on Commodore facts: (PRINT CHR$(147) will cause: 1. Clear screen 2. Clear memory 3. Snow 4. Carriage return.)

What makes this game a potential educational tool is its *Editor* section. Subject matter is not limited to the questions written by the software designer: Using a separate disk for storage, players can make up their own trivia questions in the same format as the game.

Professional Software is also looking at trivia games as educational software of the future. But their prime purpose for producing *Trivia Fever* is entertainment.

Trivia Fever is Professional's first entry in the entertainment software market, though they're well-known as the publishers of *WordPro*, the popular word processor, for the Commodore line.

Category Selection for player # 1:
BOB
2) GE - Geography
3) HI - History
4) FE - Films and Entertainment
5) FP - Famous People
JENNIFER, please enter the number for each of the desired categories from which BOB wishes to have the questions selected, or press <P> and Trivia Fever will select the categories for him at random.
Please PRESS <SPACE BAR> to continue
or PRESS <C> to change categories


Trivia Fever
Question for player #1: BOB
Question Category is:
Films and Entertainment
Selected Difficulty Level is: 1
The correct answer is:
Congratulations BOB,
it seems that you have been studying up on these.
Please PRESS <SPACE BAR> to continue

In Professional Software's Trivia Fever, *you can opt to select your own category or let the computer choose one randomly. Once the player has given an answer, the gamemaster tells the computer whether or not it was correct, and points are awarded.*

"We wanted to enter the entertainment area, but needed to find out first what was entertaining to people," says Ken Paradiso, marketing manager for Professional Software. Their research pointed to trivia. Trivia game sales had jumped from $600,000 in 1981 to $70,000,000 in 1983. Sales for 1984 are projected to exceed one *billion* dollars.

Further research revealed why Americans planned to spend that non-trivial amount of money on trivia. "One reason is obviously the maximization of social interaction," says Paradiso. "Another is the ego hit you get from the game. It's an all-win situation because even if you miss a question, it's not important. It's only trivia. People don't come down on you."

Trivia Fever was designed to minimize some of the annoyances that crop up in *Trivial Pursuit*, says Paradiso. One of those irritations is the guy who jumps up and down and yells "I know! I know!" at every question.

To combat this, *Trivia Fever* allows handicapping. Players who are more knowledgeable in a particular area, or in all areas, can be required to answer more questions, more difficult questions, or be given less time to answer.

"Handicapping is very important," says Paradiso. "You can make the game dynamically different for every person that's playing. It also allows families to play together more easily. By handicapping the parents, the kids have a better chance to win."

Trivia Fever can be played with or without a computer (a book of questions and answers and score sheets are included). Suggested retail price is $39.95, but purchasers who don't own computers can mail back their disk for a $5 rebate.

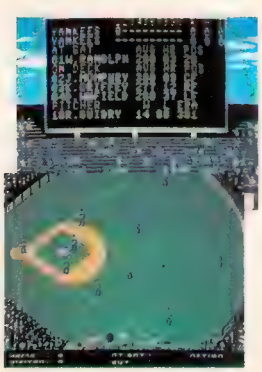
To supplement the thousands of questions contained in *Trivia Fever*, Professional Software plans to release editions specializing in sports, entertainment, word trivia, and an educational series, targeted to junior high and high school students.

Other trivia games currently available for the Commodore 64 include:

• *Master Trivia*, from Cymbal Software. Up to six players; game lengths of 50, 100, or 150 points, and time limits varying from 10–20 seconds. Cymbal has released additional disks that can be integrated into play with the master disk. Categories include sports, world facts, "Entertainment Tonight," and children's trivia.

• *Factactics*, from Daystar Learning Corporation. Players move around a game board on the computer screen, typing in answers to questions on sports,

THE WORLD'S GREATEST BASEBALL GAME. THERE'S MUCH MORE TO WINNING THAN JUST PITCHING, HITTING & FIELDING.



Real baseball is more than just hitting, pitching and fielding. It's also your favorite major league teams, the great stars of today and the All-stars of yesteryear. It's statistics and coaching, and it's managing your own game strategy. With the World's Greatest Baseball Game, you have it all. Pick your major league line-up using the actual player and team stats. Then watch the action unfold against an opponent or the computer.

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• *Fax*, by Epyx. This is the home computer version of the Exidy arcade game.

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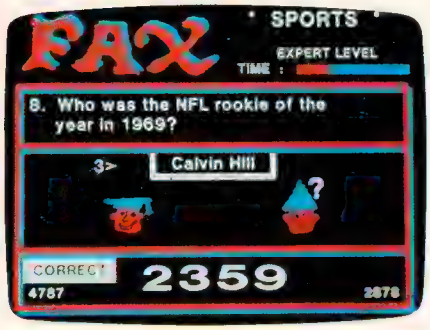

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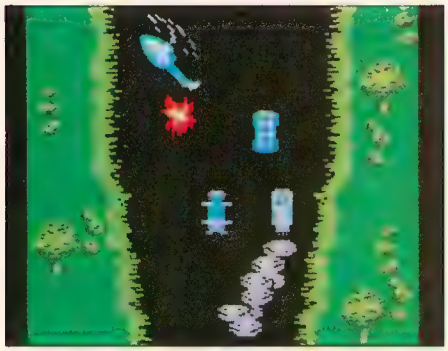
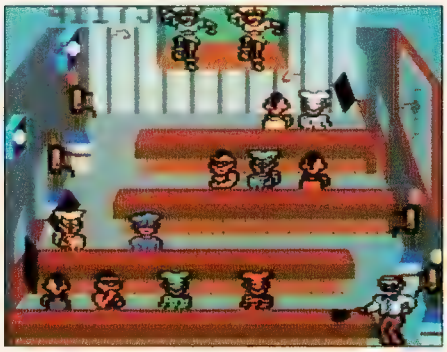


Bally Midway's Spy Hunter puts you in the driver's seat of the hottest machine on four wheels. You're after enemy spies. The situation is life and death. You'll need every weapon you've got – machine guns, and guided missiles, oil slicks and smoke screens. But the enemy is everywhere. On the road, in the water, even in the air. So you'll have to be more than fast to stay alive in Spy Hunter. You'll need brains and guts, too.

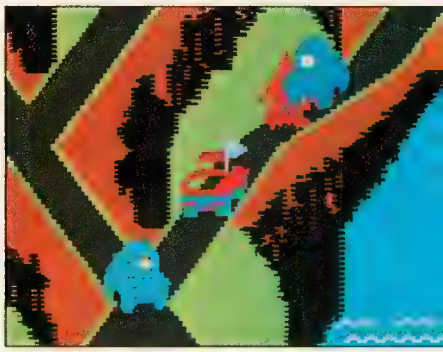
Do you have what it takes?



Bally Midway's Tapper would like to welcome you to the fastest game in the universe.

You're serving up drinks in some of the craziest places you've ever seen. And the service better be good, or else. You'll work your way through the wild Western Saloon to the Sports Bar. From there to the slam dancing Punk Bar and on into the Space Bar full of customers who are, literally, out of this world.[1]

Are you fast enough to play Tapper? If you have to ask, you probably already know the answer.



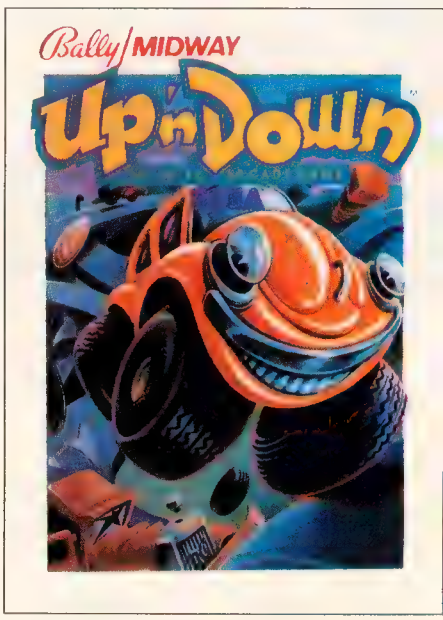
Bally Midway's Up 'N Down by Sega. In this game, a crash is no accident.

In fact, it's the whole object of the game. You'll race your baja bug over some of the worst roads south of any border. Leap dead ends, gaping canyons and oncoming traffic in a single bound. And if anyone gets in your way, crush 'em.

Crashing, bashing Up 'N Down. It's one smash hit that really is a smash.

The #1 Arcade Game of 1984.

Nominated as Most Innovative Coin-Op Game of 1984 by *Electronic Games* magazine.



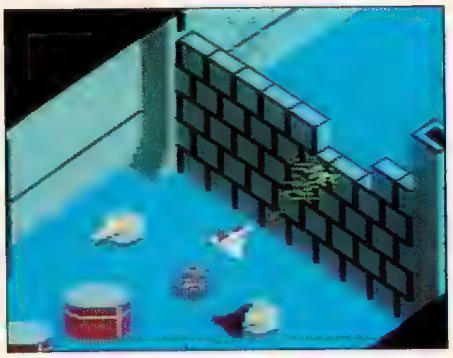
#1 Arcade Hit, *Play Meter* Conversions Poll, 8/1/84.

WERE SUCH BIG HITS, THEM HOME.

Sega's Congo Bongo rocked the home game world when it shot up to Number 3 on the Billboard chart this spring.

And now it's available for even more home systems. So check the chart and get ready for jungle action. You'll pursue the mighty ape Congo up Monkey Mountain and across the Mighty River. Do battle with dangerous jungle creatures. Ride hippos, dodge charging rhinos and try to avoid becoming a snack for a man-eating fish.

Congo Bongo. It's fast and it's fun. But be careful. It's a jungle in there.



Sega's Zaxxon. If you haven't played Zaxxon, you must have been living on another planet for the past few years.

And now the ultimate space combat game is available for even more home systems. You'll pilot a space fighter through force fields and enemy fire on your way to do battle with the mighty Zaxxon robot. Countless others have gone before you in this Hall of Fame game. But this time your life is in your own hands.

Zaxxon killed them in the arcades. But compared to what it will do to you at home, that was child's play.

	SPY HUNTER	TAPPER	UP 'N DOWN	CONGO BONGO	ZAXXON
Atari 2600 cartridge	✓ NEW	✓ NEW	✓ NEW	✓	✓
Atari 5200 cartridge				✓	✓ NEW
Atari Computers* cartridge	✓ NEW	✓ NEW	✓ NEW	✓	✓ NEW
Atari Computers† diskette	✓ NEW	✓ NEW	✓ NEW		✓
ColecoVision & ADAM cartridge	✓ NEW	✓ NEW	✓ NEW	✓ NEW	✓
Commodore 64 cartridge	✓ NEW	✓ NEW	✓ NEW	✓	✓ NEW
Commodore 64 diskette	✓ NEW	✓ NEW	✓ NEW	✓ NEW	✓
Apple II, IIe, IIc diskette	✓ NEW	✓ NEW	✓ NEW	✓ NEW	✓
IBM PC diskette	✓ NEW	✓ ** NEW	✓ NEW	✓ ** NEW	✓ ** NEW

Arcade and Home Smash. Hit #3 on *Billboard* magazine's Top Video Games survey.

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*Atari 400, 800, 600XL, 800XL and 1200XL. (Congo Bongo cartridge: 400, 800 and 800XL.)
†Atari 800, 600XL, 800XL and 1200XL.
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SIMPLE ANSWERS TO COMMON QUESTIONS

Q A

Tom R. Halfhill
Staff Editor

Each month, COMPUTE!'s GAZETTE *tackles some questions commonly asked by new Commodore 64/VIC-20 users and by people shopping for their first home computer.*

Q. ***I own a Commodore 64, and I have a few friends who own Atari 800XLs. I'd like to know if it's possible to convert programs written in Atari BASIC to Commodore BASIC. If this is feasible, are there any publications that can guide me in converting programs? Also, is there any program that would allow me to use disks formatted for the Atari on my Commodore 64? I have a Commodore 1541 disk drive.***

A. It's quite possible to convert programs written for Atari computers to work on Commodore computers, and vice versa. In fact, our staff programmers do this all the time for our companion magazine, COMPUTE!. Fortunately, the Commodore 64 and Atari computers have similar features, making conversions easier. Both machines have sprites (called *player-missile graphics* on the Atari), comparable high-resolution graphics, programmable character sets, and versatile sound capabilities.

However, unless you're a pretty good programmer, translations will not be a snap. While the Atari and Commodore both have built-in BASIC languages, the BASICs are two different dialects. Commodore BASIC is Microsoft BASIC, the most common version found on microcomputers. Regular Atari BASIC closely resembles Microsoft BASIC, but differs in several ways. Sometimes these differences matter, and sometimes they don't—it depends on the program.

For example, programs which use lots of string manipulations may be hard to translate back and forth. Atari BASIC lacks the string arrays and substring statements found in Microsoft BASIC. The statement:

```
DIM A$(10,10)
```

sets up a two-dimensional string array with 100 elements on the Commodore 64, but would trigger a syntax error on the Atari. The Atari recognizes only one-dimensional strings. This statement:

```
DIM A$(20000)
```

would be interpreted quite differently on an Atari and a Commodore. The Atari would reserve a single string variable 20000 bytes long; the Commodore would reserve a one-dimensional string array with 20000 elements. That's because Microsoft BASIC limits strings to 255 characters, while Atari BASIC allows strings of any length, up to the limit of available memory. These statements:

```
X$=LEFT$(A$,10)
X$=MID$(A$,11,10)
X$=RIGHT$(A$,10)
```

would fill the Atari's screen with syntax error messages, because Atari BASIC lacks such substring manipulators. Instead, the Atari uses a different method of subdividing strings. Assuming that A$ is 30 characters long, the equivalent statements would be:

```
X$=A$(1,10)
X$=A$(11,20)
X$=A$(21,30)
```

while on the Commodore, these same lines would refer to certain elements of two-dimensional string arrays. Looks hopeless, doesn't it?

There are other differences between Commodore BASIC and Atari BASIC as well. Usually you can program around them, though. The differences that might give you the most trouble include anything involving memory manipulations, such as sprites and redefined characters, and the built-in graphics commands in Atari BASIC, some of which must be written in machine language on the Commodore 64. Conversely, to simulate the music of the 64's SID chip you'd need machine language on the Atari.

Translating programs from one computer to another requires lots of experimentation and patience. It also helps immensely to have both machines handy. We can't recommend any books specifically written for Atari-to-Commodore BASIC translations because we don't know of any. Our staff programmers are guided by programming reference manuals and memory maps for the various computers they work on.

You won't be able to read Atari disks with your Commodore 1541 disk drive, either; the formats are completely different. To save time typing in long programs to be translated, our programmers sometimes transfer the code from one computer to another via modems. Often, however, they don't even attempt a line-by-line

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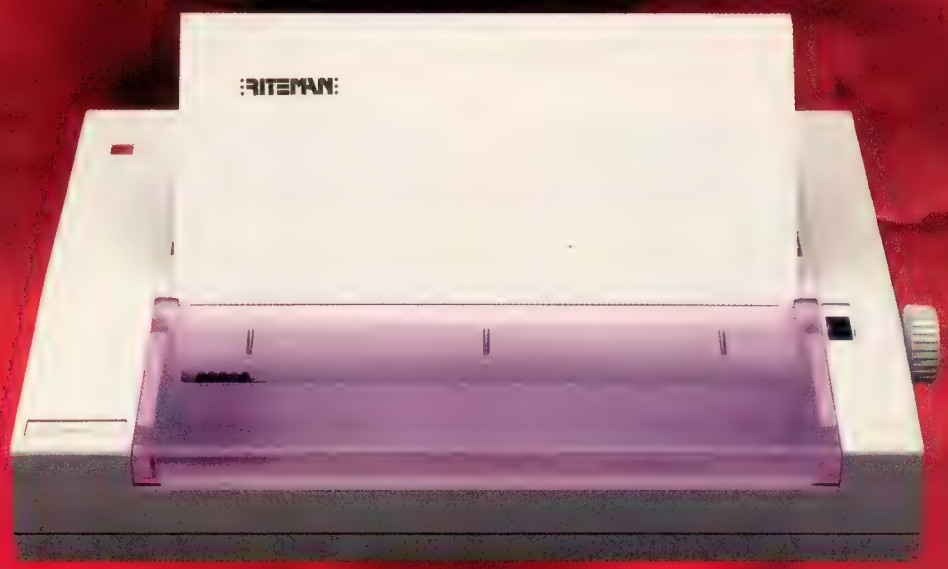

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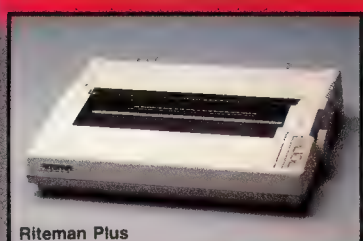

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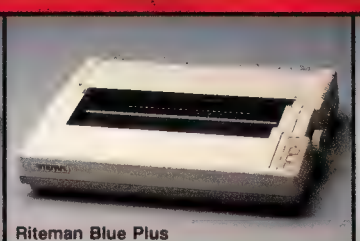

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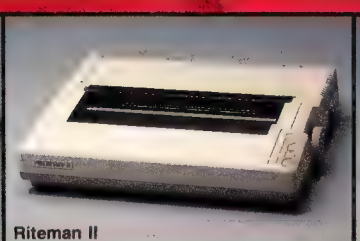

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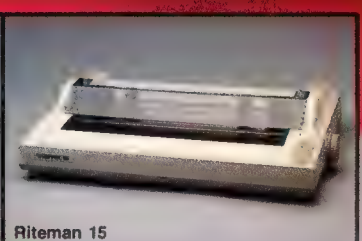

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translation—too many changes are required. Instead, they start almost from scratch and write a version that is similar but not identical. That way, the programs can take advantage of each computer's best features.

Q. ***I have an IBM PC and a Commodore 64. My IBM has a serial (RS-232C) port. Is it possible to get an RS-232C port for my Commodore 64 and transfer data?***

A. It's possible to transfer data between almost any two computers, but usually some experimentation is required. You might also have to make your own cables or have them made for you.

First of all, the serial port on the rear of a Commodore 64 is *almost* a standard RS-232C port—the only difference is the voltage level. You can convert it by plugging in an RS-232C adapter, available from Commodore and various other companies for less than $50 (scout the ads in this magazine).

Next, you'll need something called a *null modem cable*. This is just a simple cable that fools a pair of computers into thinking they're linked up over the phone lines with modems. A few wires are crossed so that what's an input line on one side is output at the other. One end plugs into the RS-232C adapter on the Commodore 64, and the other end plugs into the IBM PC serial port. Null modem cables are available from several manufacturers, although you might have trouble finding one with exactly the plug connectors you need.

Finally, each computer will have to be running its own *terminal software*, a program designed for telecommunications with a modem. The terminal software must be set up to recognize a modem plugged into the serial port. Of course, there won't really be any modems attached—only the null modem cable. When everything is hooked up, you use the terminal software (which must have upload/download capability) to transfer the file from one computer to the other.

The whole process can get much more complicated than it sounds. Besides acquiring the proper cables and plugs, you have to make sure the computers are sending and receiving at the same rate, that the telecommunications parameters are properly adjusted, and other things. We've successfully used null modem cables to transfer files between an Atari, IBM PC, TI-99/4A, and TRS-80 Color Computer, but it took some work. If you already have a modem and terminal program for each computer, it might be easier to simply transfer the files over the phone lines or even a phone cord connecting the two modems.

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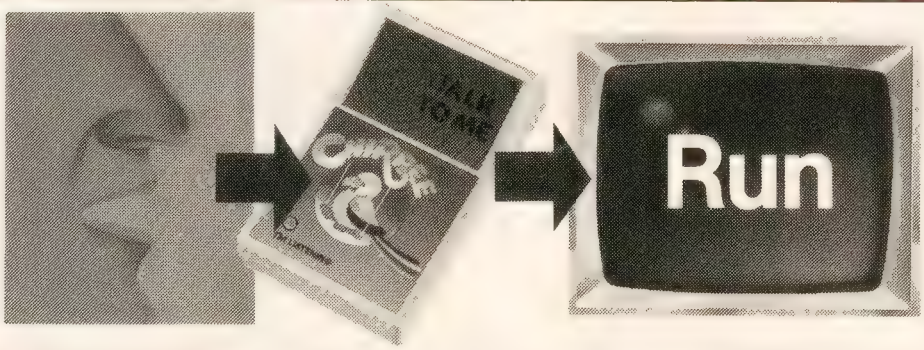

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Byron Preiss And Ronald Martinez

Trillium Software Designers

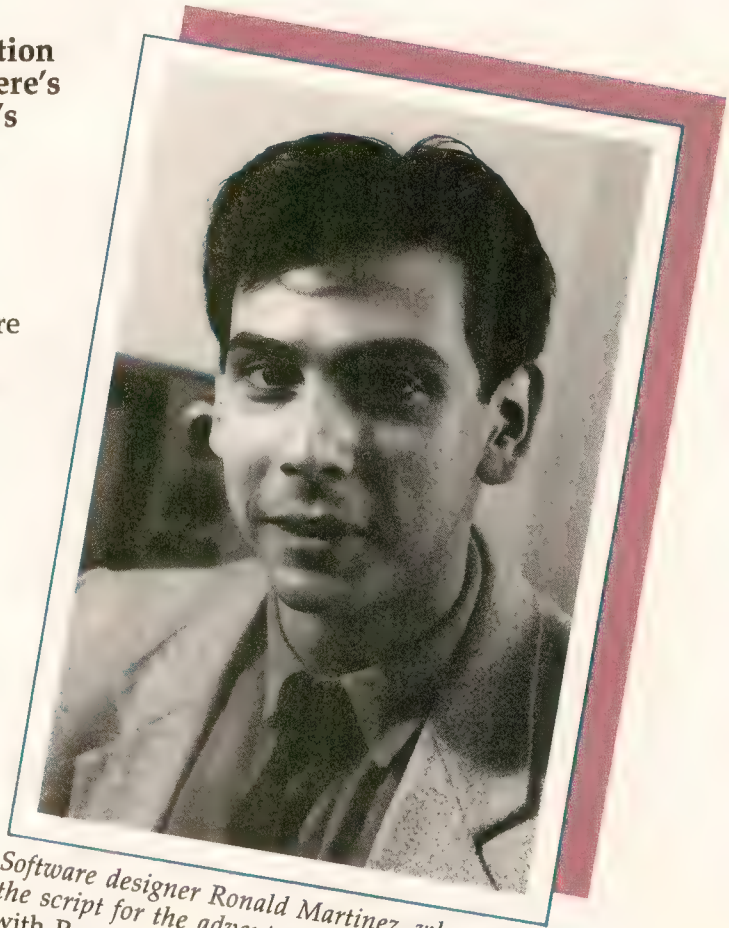
Sharon Darling, Research Assistant

How do you go about translating science fiction and fantasy novels into computer games? Here's how two of the designers behind Spinnaker's new Trillium series did just that.

Computer games were originally little more than fast-moving action shoot-'em-up's or text adventures with severely limited vocabularies. But programmers have begun to advance the sophistication and the interaction of all types of computer games. The next generation of games has arrived—science fiction and fantasy novels turned into graphics text adventures.

Among the leaders in this new genre is Spinnaker Software, which this fall released the first entries in its Trillium series for the Commodore 64 and Apple II computers. Trillium includes adaptations of such novels as the classic *Fahrenheit 451* by Ray Bradbury, *Rendezvous with Rama* by science fiction master Arthur C. Clarke, and *Dragonworld*, a fantasy by Byron Preiss, Michael Reaves, and Joseph Zucker.

Also available are *Amazon*, an adventure tale developed by author Michael Crichton, a video version of Robert A. Heinlein's *Starman Jones*, and *Shadowkeep* from Alan Dean Foster. The Commodore versions sell for $32.95 each, while the Apple versions cost $39.95.



Software designer Ronald Martinez, who wrote the script for the adventure Rendezvous with Rama.

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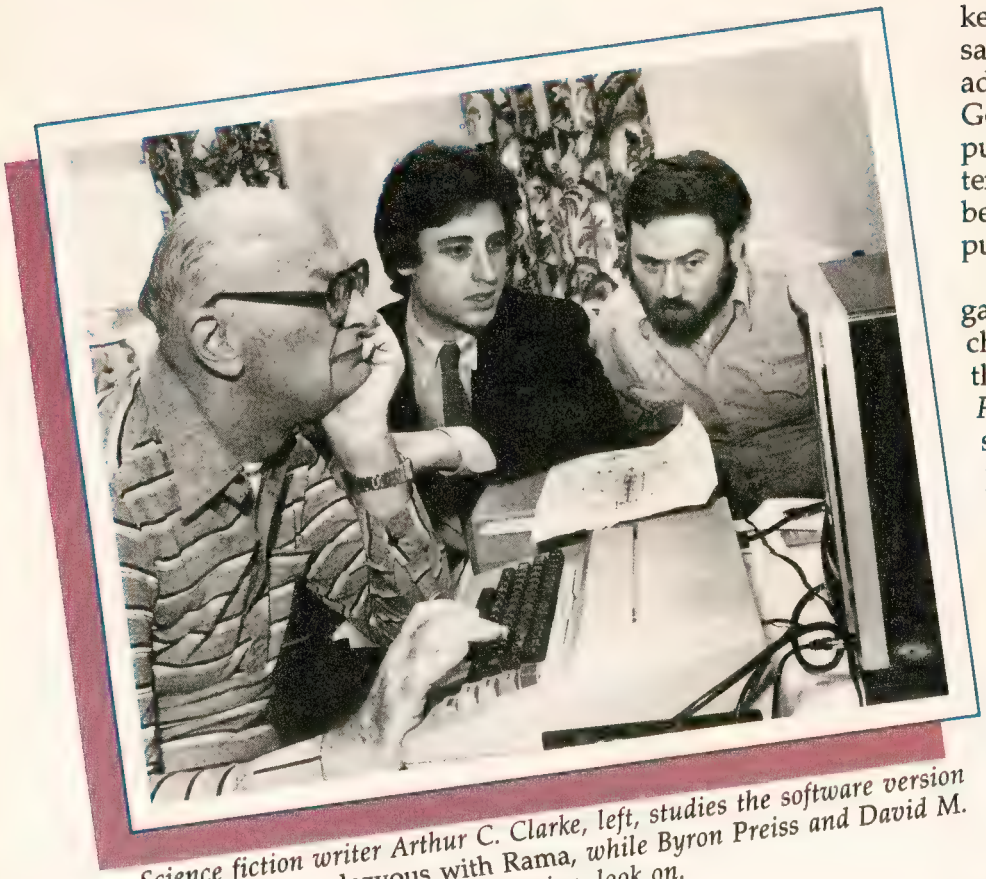

Science fiction writer Arthur C. Clarke, left, studies the software version of his novel Rendezvous with Rama, while Byron Preiss and David M. Harris, who worked on the adaptation, look on.

Between them, the authors involved with the series have 100 million books in print, according to Seth Godin, Trillium project manager. Other authors whose works are scheduled to be adapted include Harry Harrison and Roger Zelazny.

How do you go about turning a novel into a computer game? "The key point is having a dialogue with the author," says Byron Preiss, whose company, Byron Preiss Video Productions, developed four of the releases in the Trillium series. "For example, in *Fahrenheit 451*, it meant sitting down with Ray Bradbury and saying, 'All right, this is a medium that's totally different from a film, and it's totally different from a book.'

"It doesn't have some of the advantages of a film, but it does have flexibility. In other words, a character is able to take different actions, whereas in a book you can only do one thing."

In addition to *Fahrenheit*, Preiss's company did the adaptations for *Rendezvous with Rama, Dragonworld,* and *Starman Jones*. Preiss is also working on another software line for Spinnaker, the Windham Classics, turning such literary favorites as *Wind in the Willows, Treasure Island,* and *20,000 Leagues Under the Sea* into interactive fiction.

From *Fahrenheit 451*: The time is not too long from now. The place is New York City.... This is a world where simply owning a book is dangerously illegal.... You, Guy Montag, are a rebel fireman with a passion for books—the most wanted fugitive in the country....Your mission: To restore to the world the freedom it once had.

"The adventure game market has been pretty much the same since 1976, when the first adventure game came out," says Godin. "That is, they've been puzzle-based games, be they text or graphics—they've always been based on a series of logic puzzles.

"We're trying to make a game that is based on plot and characterization, not puzzles—the way a book is. If you read *Fahrenheit 451*, you don't get stuck on page 50. And if you play the game, you don't get stuck on frame 50, because the whole idea is that you're interested in the game because of the characters and the plot and what's happening. You care about what's going on."

But what are these new adventures—games, interactive fiction, or books? To Ronald Martinez, who wrote the script for *Rendezvous with Rama*, "That's the dilemma with this medium—it's very difficult to put a name to it because it's like the classic instance of describing a color that no one's ever seen before."

Preiss and Martinez both like the term *electronic book*. That phrase "is the best at the moment, because you read it," Preiss says. "It's a reading medium."

Both authors are now doing something that ten years ago was beyond their imagination: working with personal computers. Neither one majored in computer science in college—"there was no such major" at the time, the 31-year-old Preiss recalls.

The New York native went to the University of Pennsylvania, where he earned degrees in communications and urban studies. He then did graduate work in film at Stanford.

"I guess from the time I was a kid in school, I was interested in science fiction and electronic media. I think almost everyone from our generation

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was," he says. "We grew up with television sitting in our laps, so that was a natural interest."

In addition to college, Preiss also spent time at Xerox's PARC (Palo Alto Research Center), where his interest in computers was fueled. After working for Sesame Street and the American Broadcasting Company as a designer of children's programming, Preiss started Byron Preiss Visual Publications in 1979 to develop television material and publish books, "but we quickly saw software as the best way to teach."

The fantasy adventure Dragonworld, *was adopted for Spinnaker's Trillium series from the book of the same name.*

From *Rendezvous with Rama*: The year is 2130, and a huge new asteroid has just been discovered and named: Rama.... But this is no asteroid—Rama is actually a mammoth spaceship.

As fate has it, only one of Earth's ships is close enough to Rama to meet it—and it is the ship you command....Your orders: Rendezvous with the ship, explore it, find its creators, and return home—if you can.

Ronald Martinez is also a New York native, and he, like Preiss, is 31. His interest in science fiction dates from the second grade, when he read his first science fiction book, *Great Stories of Space Travel.*

Science fiction "was really like something I had never imagined to exist, and I had the same feeling when I started to work with the computer, which was through Byron," he adds.

Martinez went to college at Stony Brook University on Long Island, where he earned a degree in English. He later wrote interactive children's fiction for Visual Publications. Preiss then approached him about doing the adaptation for *Rendezvous with Rama.*

Nearly all of their waking hours are now spent working with computers—IBMs, Apples, Commodores, and Ataris for Preiss, IBMs and Ataris for Martinez.

Preiss's interest in computers and books led him to approach Spinnaker about creating interactive fiction. His firm had already published works by both Bradbury and Clarke, and "partly out of that relationship with them, we were able to take the first steps toward doing this project."

Turning novels into computer adventures means keeping the quality of the story intact. "I think the challenge which we met in all the games was to come up with things that amplify the book, and are faithful to it," says Preiss. "For example, what Ron conceived for exploring the inside of the Rendezvous' alien ship is faithful to all of Clarke's ideas, yet it's more than the book."

Martinez says, "The means of moving about in the ship, for example, have been enhanced so that you can get into places in the Rama structure which you wouldn't be able to get into in the book version. So if you had read the book, you could find new places to explore, and new things to discover in the adventure."

The "frustration factor" was something else the authors had to deal with—they wanted to make the games challenging, and yet not so difficult that the player would feel like giving up.

"The difference in a lot of these games is that you can talk to people," Preiss says.

"In *Dragonworld*, for example, Hawkwind is your companion, and you can have a dialogue with him to get help. In *Rendezvous*, you can communicate back to your crew, and Ron set it up so you've got three different crew members, any of which, at any given time, might give you a different piece of information."

While the puzzles are there, Martinez says, "they're not the whole point. The point is, you're in this world, and it's a story that unfolds. We never sacrifice dramatic progress for the sake of a kind of deep puzzle that you might spend two weeks on."

In the Trillium series, graphics play an integral part in the game, says Martinez. "I think a lot of adventures have used graphics which tended to be kind of superfluous because the text really covers what's there, and it's kind of nice to see the picture, but not necessary.

"In this case, a lot of the graphics are really your only kind of clue or direct link to a part of the story. So what you see there really affects what you do."

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Comparisons between Trillium and such interactive fiction heavyweights as those from Infocom are perhaps inevitable. But to Preiss and Martinez, Trillium stacks up favorably with all-text adventures.

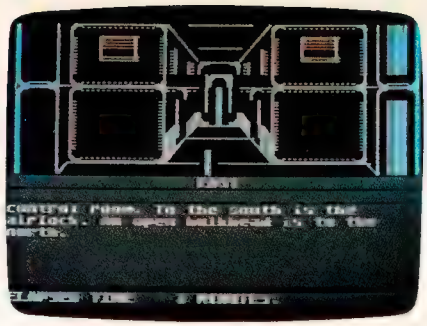
"I think Infocom has set the standard for text input, and most of the time that you buy a graphics adventure, or any kind of unusual adventure, you see those standards going by the wayside," Preiss says. "I think what Trillium has tried to do is keep the standards of the high quality text adventure consistent and at the same time, put in the things that really make use of the computer."

For those who prefer their own imagination to an artist's conceptions, however, Preiss has added the option of playing the games without the graphics.

Sophisticated language is another extra for Trillium, Martinez feels. "It's more sophisticated than any other graphics adventure that I've seen. And the sentences that are understood by the computer, by the program, are full natural language sentences."

Martinez and Preiss were not alone in coming up with their adaptations—Clarke, Bradbury, and Heinlein worked directly with them in converting their works into electronic books. In addition, up to 12 people were involved in the process of developing each game. And in the case of *Rendezvous with Rama*, architects were hired to design the interior of the alien ship.

From *Amazon*: You've just been hired by NSRT, a top-secret, high-tech research firm. You knew your work wouldn't be easy—but you weren't expecting your first assignment to be a solo expedition to one of the most dangerous, most unexplored areas on Earth.



In Rendezvous with Rama *you and your crew must explore a giant spaceship.*

Nevertheless, you're on your way to the Amazon, on a mission whose purpose is secret and whose dangers are deadly.

The collaboration with Arthur C. Clarke "was a unique case because almost all the work, except for two meetings, was done via mail and the phone," with Clarke responding from his home in Sri Lanka, Preiss says.

Some responses came in a rather unorthodox way, however—via space satellite. "He has been working with the director of *2010* (sequel to the movie based on Clarke's *2001: A Space Odyssey*), and they're online via space satellite," Preiss says.

Ray Bradbury's Fahrenheit 451 *is another entry in Spinnaker's Trillium series.*

But communicating via satellite is nothing new for Clarke, who was the first to propose the idea of geosynchronous satellites, in a story published decades ago. He has also delivered book manuscripts electronically from Sri Lanka to New York.

"In the course of working on the game, he would often send us messages on the computer that someone would call up and dictate. Ron came up with a very clever way to do some things differently from the book, and any time that would happen, we would want to get approval from Arthur. It would often come in the way of 'tell them it's OK,' via satellite."

Working with Bradbury was a pleasure, Preiss says. "He brings the enthusiasm of a young boy—unbelievable, unbounded enthusiasm for something new."

For the adaptation of *Dragonworld*, Preiss, who cowrote the book, worked with fellow author Michael Reaves to come up with the game of the same name.

Neither Martinez nor Preiss take much stock in the argument that good authors don't necessarily know what makes a good computer game.

"That's why they're not working alone. I think the idea here was to take talented writers and put them together," says Preiss.

In Martinez's view, "I think a great writer would definitely have created the elements for a good game, in that a well-written book has within it a plausible universe, and that's what we're engaged in here, constructing plausible universes."

For the future of electronic books, the two authors see no limits. Says Martinez, "Marrying the technology with the artistic impulse is a good way to create something that hasn't been seen before—there are no limitations."

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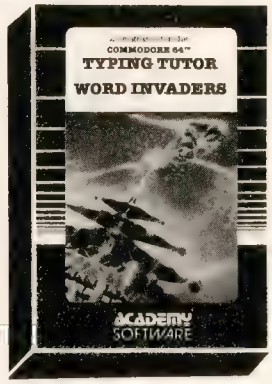

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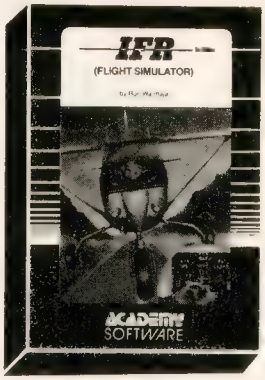

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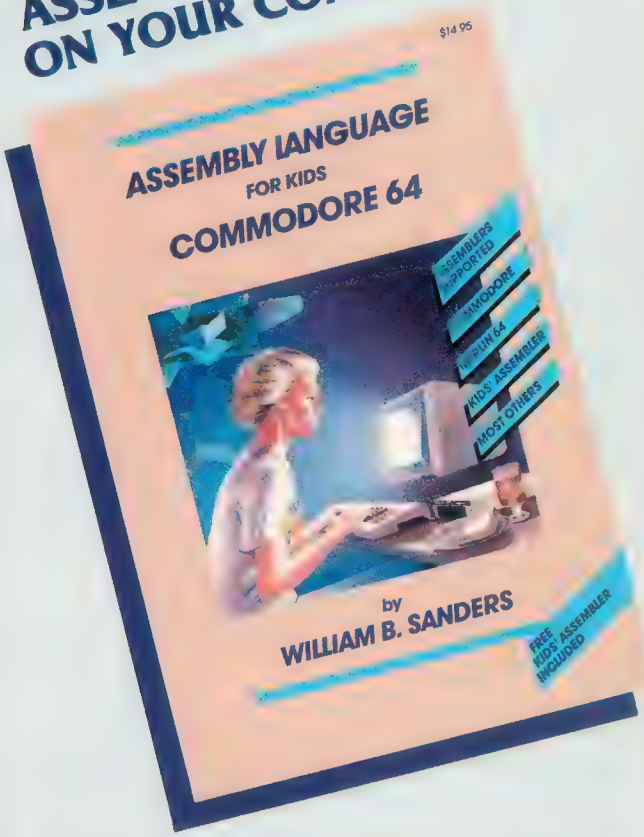

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An Adventure In Telecommunications

Fred D'Ignazio, Associate Editor

A Computer Ostrich

I use computers for word processing, games, and education, but until recently I never used them for telecommunications. I was like an ostrich—keeping my head firmly in the sand.

Every now and then I would read a computer magazine article about telecommunications. But when I lifted my head out of the ground, I felt like an infantryman caught in a cross-fire. Telecommunication terms like *baud rate, parity, asynchronous communication, word length, stop bits,* and *xmodem protocol* whizzed over my head like angry bullets. Needless to say, I immediately stuck my head back into the hole in the ground. I figured it was safer there.

Then one day last summer I attended the CES (Consumer Electronics Show) in Chicago. I was walking by the Prentice-Hall Software booth and ran into Ken Skier. I remembered Ken as the author of *SkiWriter,* a word processing package for the Epson HX-20, the tiny lap-sized computer with only a few thousand bytes of total memory. Now Ken was all fired up about a new word processing program he had written for the Commodore 64 called *SkiWriter II.*

This new word processor comes on a 16K memory cartridge that plugs into the back of the 64, and costs $69.95. You can learn more about *SkiWriter II* by contacting:

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To Ken, 16K is *a lot* of memory, and he had no trouble at all fitting a powerful word processing program into the cartridge.

But that's not all he put into the cartridge. He had so much space left after he wrote the word processor that he decided to add a telecommunications program, too. So *SkiWriter II* for the 64 is not just a word processor, it's a *communicating* word processor.

There is a precedent for this idea on the little, notebook-sized computers like the Model 100 from Radio Shack and the NEC 8201. These little computers have a telecommunications program and a word processor built into the circuits when you bring them home from the store. The programs are separate (unlike the *Skiwriter II),* but they are so easy to use, it's like they're really the same program.

When Ken showed me *SkiWriter II* at CES, he asked me to sit down and try it out. I hate trying new programs out in front of other people, because I always end up doing foolish things. Despite my reservations, I sat down at the computer and began typing.

One-Touch Functions

The first thing I noticed was the plastic overlay that fit around the 64 keyboard. There were 21 functions assigned to special keys on the keyboard, but the functions were all simple like FIND, REPLACE, TOP, BOTTOM, CANCEL, and EXECUTE, and they were written in big, bold letters. This didn't look too hard. Maybe I wouldn't look like a fool after all.

Next we plugged in the cartridge and turned on the computer. On the screen a menu appeared with an arrow pointing to the top item:

→ **Edit**
Preview
Print
Use Cassette
Use Disk
Use Modem
Select Colors
Delete the Document

I pressed the arrow keys on the 64 and made the menu (not the arrow) move up and

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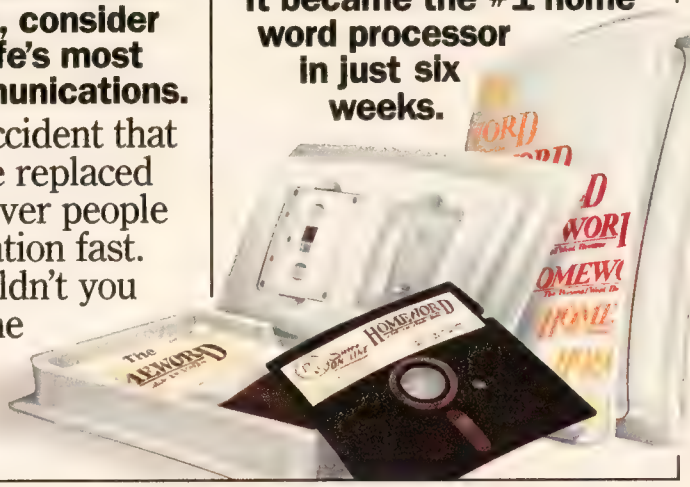

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down, slowly at first, then fast like a bouncing ball. I could have sat there another couple minutes just watching the menu bounce up and down, but I could tell that, behind me, Ken was getting a little bored.

I stopped the bouncing menu at Edit and pressed the EXECUTE button. The screen emptied, and I was ready to begin creating a document.

I created a document easily by letting my fingers go wild. I filled the screen with gobbledygook characters.

"This is neat," I told Ken, "but I can't read the white characters on the blue background very well."

"No problem," Ken said. He showed me how to bail out of Edit (by pressing the CANCEL button) and how to select new text and background colors. I chose black letters on a white background, because it gave me the pleasant illusion that I was using paper and a typewriter rather than a computer and a video screen.

Next, we backed our way into Edit again. I noticed that the computer had remembered the trail we had followed out of Edit, so all I had to do was hit the CANCEL key a couple times. I felt like Hansel or Gretel following bread crumbs through the forest. The computer had remembered my pathway so I couldn't wander off into the forest of unexplored commands.

When we returned to Edit, Ken showed me how to press the different function buttons (all clearly marked with the plastic overlay). We moved blocks of text around, we copied blocks of text, we underlined words—yes, *underlined words right on the screen!*—and we replaced typos with some genuine English, and deleted huge clumps of especially hopeless gobbledygook.

After only about ten minutes of fiddling around with the text, I was zipping around, correcting errors, inserting new sentences and words, and making corrections. After only 15 minutes the whole document was completely spruced up and (to my eyes) error free.

I did have some problems, though. First, as I typed, the overlay tended to move around a little underneath the palms of my hands. This was distracting at first, but I soon got used to it. It didn't slow my typing.

Second, I missed having any commands that would allow me to jump from one end of the line to another, or jump from the beginning of one word to the next, so I could move the cursor even faster along a particular line.

Third, it took me awhile to remember to use the EXECUTE key (f3) instead of the RETURN key to choose items in the *SkiWriter II* menu. (You use the RETURN key, however, when you are typing your document.)

Fourth, it was hard getting used to using the backspace key as the DELETE LEFT key on the upper lefthand corner of the keyboard instead of its normal place on the upper righthand corner.

However, there were numerous appealing things I found while using the word processor, too. First, the DELETE LEFT key on the left allowed Ken to use the DEL key on the right to let me delete text to the RIGHT (beginning with the cursor). This way, when I wanted to correct a word, I could move in either direction, no matter where I ended up on the word.

This is a great feature for those of us who are somewhat klutzy with their fingers. In my haste to zip around a document in my tiny cursor "airplane," sometimes I come in for a landing on a word and almost miss it. It's great to begin deleting to the right or the left depending on where I have haphazardly landed.

Also, the RETURN character has special status in the word processor and can be edited, so you can use the FIND command and find the RETURN character and replace it or add extra spaces, or whatever. This can be a great help when you need to reformat a document.

And there are lots of nice touches. When you insert text, even at the beginning of a large document, *the whole document* instantly moves down to make room. The paragraph and the whole document automatically and swiftly reformat. There is no wait whatsoever.

Also, the word-wrap happens instantaneously, so you can go typing along and never worry about fitting things on the screen.

And when you want to print your document, you don't have to remember all sorts of esoteric commands to double or triple space the lines, or add headers, or increase the size of your margins. Instead, you just press the EDIT key and the DOT LINE key and step through a menu. As you make your choices, the computer automatically inserts dot formatting commands into the text of your document.

Later on, when you become a more seasoned user, you can bypass this phase by typing the dot commands into your document yourself *in English*. For example, you can type:

```
.SPACES = 1
```

to single-space the document. And when this gets to be too tedious, you can abbreviate the command to .S=1.

Once you are done editing your document, you simply press the CANCEL key to get out of Edit and bounce the menu around until you get to PRINT. And, if you have a printer connected, you just press the PRINT key a second time and your document prints out.

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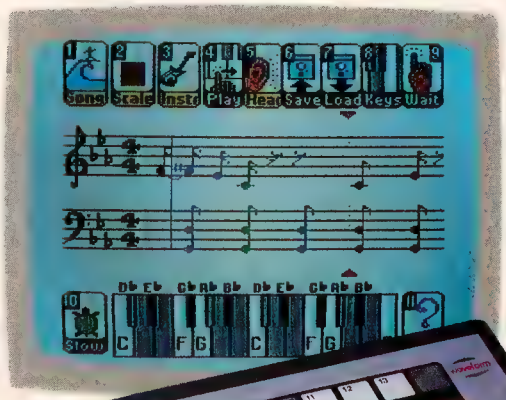
No matter what your musical ability, Waveform's Creative Music System will lead you into a new world of musical enjoyment and education.

The ColorTone Keyboard—Fun And Easy For Children 8 to 80

With Waveform's ColorTone™ Keyboard, and your Commodore 64™ computer with disk drive, you can make music—and learn about music—as quickly as you can say Do-Re-Mi.

The ColorTone Keyboard comes with software that makes discovering music a simply marvelous and marvelously simple experience. To begin playing you simply touch one of the graphic symbols on the keyboard. Just point to select one of the ColorTone's preset songs, change the musical scale you're playing in or make your Commodore 64 sound like one of eight different instruments.

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With Waveform's ColorTone Keyboard, your very first musical experience can be fun and rewarding. Every time you play you'll develop greater musical competence. And confidence.

While you can use the ColorTone Keyboard by itself, it will also add new dimensions to the other software products in Waveform's creative music system.

MusiCalc™—The World's Most Exciting Musical Software

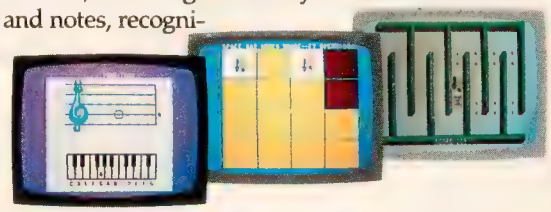
Waveform's MusiCalc™ system includes programs that let you compose, edit and perform your own musical creations using the Commodore 64. You can also turn your improvisations into musical notation and create your own keyboard scales.

The newest member of the MusiCalc family is the MusiCalc Synthesizer with Sound Teacher.™ With it you can learn all about sound synthesis and then use its performance-oriented synthesizer program to apply what you learn.

MusiCalc software works with the ColorTone Keyboard or with the Commodore 64's typewriter keyboard.

Keyboard Krazy With Treble Clef Cat—Making Music Play For Children 4 Years And Up

This unique software package makes music a game your children will love learning. Four fun, colorful programs help the youngest child develop essential music skills, including familiarity with the musical staff and notes, recognition of notes on the keyboard, and ear training. All in a fun way that'll make your young, potential musicians eager to learn more.



Keyboard Krazy works on the Commodore 64 with or without the ColorTone Keyboard.

Discover the growing family of computerized music products from Waveform and make music play for every member of the family. Look for the ColorTone Keyboard and the entire Creative Music System at a store near you.

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Saving The Best For Last

SkiWriter II is a fine word processor, but its best feature is how easy it makes using the telephone with your computer.

After I finished typing my document and saving it on disk (with just a couple extra keystrokes—*SkiWriter II* even enables you to format the disk within the program), Ken and I plugged a Commodore Automodem into the 64's user port.

According to Ken, almost any modem that plugs directly into the user port will work, including the Automodem and VICmodem from Commodore and the HesModem from HesWare. Also, acoustic couplers (such as the Lex-11 and Lex-11B from Lexicon) can be plugged into the back of the 64 if they have an RS-232C interface (such as the MFJ-1228 from MFJ in Alabama).

We set the AutoModem's switches to Data (instead of Talk), Originate (to "originate" a phone call), and Full Duplex (the standard setting for micros to talk to each other or to big computers).

Then I pressed the CANCEL key and got the main menu. I bounced the menu to USE MODEM. I selected AutoModem and DIAL, and the computer asked me which number to dial. I typed in a number Ken gave me, and the computer dialed an IBM PCjr right next to me in the booth. The PCjr was running its own version of *SkiWriter*. The PCjr answered the telephone, and waited for me to begin typing.

Ken had me enter the *conversation* mode in *SkiWriter*. This is the mode you use when two computers running *SkiWriter* are talking to each other.

Ken sat down at the PCjr and typed me a message. As he typed it, I saw it appear, letter by letter, and word by word, on my 64. I could hardly believe it. A PCjr was talking to a 64 as easily and casually as if this sort of thing happened every day. And we were talking over the phone line. We were only a couple of feet apart, but we could have been a couple thousand miles apart.

After we sent messages for a few minutes, Ken pressed the f7 key and the words CAPTURE ON appeared on the screen of his PCjr. He had me press the CANCEL key and bounce the menu to upload (transmit) a document. As soon as I did this, my document began zipping across the phone line and appeared on Ken's screen. At the same time it was being stored in the memory of Ken's computer. We watched the numbers whiz by on the screen, showing the memory being used up by the document as it rushed into the computer.

When the document was completely transmitted to Ken's computer, he loaded a document from his disk and we reversed the process. He selected UPLOAD, and this time I typed DOWNLOAD on my 64, and a moment later the cursor raced across the screen indicating that the document was being transmitted and stored in my computer.

After we were done sending each other documents, I pressed CANCEL, pressed USE AUTOMODEM, and chose HANG UP. My computer hung up the telephone. Ken issued the same commands, and his computer hung up at the other end.

Then I chose Edit on the menu and there was my old document. Underneath, neatly appended to it, was the document I had just received from Ken's computer. Now I could edit the document, change it, delete it, copy it, save it to disk, print it, or send it along the phone wire to some new computer and to another person.

An Ingenious Marriage

After visiting Ken's booth at CES, I was bitten by the telecommunications bug. I returned home to Virginia, and immediately started teaching my 23 computers how to talk on the telephone.

This was no easy task. The truth is, many computers would rather remain isolationist and *never* talk to another computer—or to another person.

But I persisted, and today most of them can talk over the phone. We even have two phone lines so they can talk to each other.

I have tried out many different communications programs since playing with *SkiWriter II*, but I haven't found another communicating word processor. It is convenient to be able to create a document, and in the same breath, send it via electronic mail across the country to a friend, a member of the family, or to a publisher.

Simplicity, convenience, and ease of use are important features for any program that lets you create and send information electronically. Most electronic mail services (like the Source, CompuServe, or MCI Mail) are somewhat picky.

They like documents to be in pure text, or ASCII, format. This is the type of format *SkiWriterII* documents appear in. You don't have to fiddle around with a document after you type it up, you just send it.

And receiving documents is just as simple. You just point to DOWNLOAD or set CAPTURE ON and wait while the document is loaded into your computer. Then you can display the document you're receiving on the screen, and you can go into EDIT, spruce it up, and make it pretty. Then you can print it out or save it to disk. You don't have to fool around with complicated commands or telecommunications jargon.

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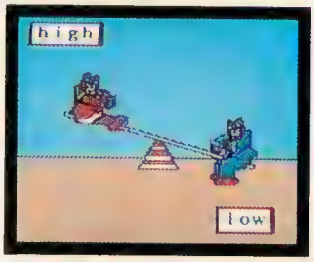
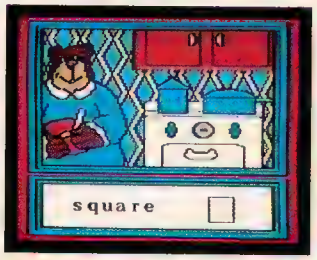
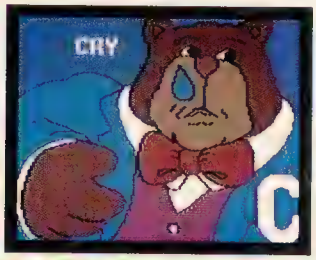
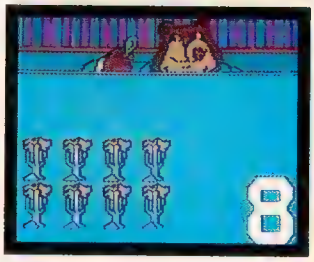


Stickybear Shapes



Stickybear ABC





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A/M88AK6

Commodore® 64 Owners!
Now Stickybear® Numbers and Stickybear Basketbounce are available for the Commodore 64 with disk drive.

Word Guess

David W. Rose

You'll have to make quick, educated guesses in this word game, which can easily be modified for any age group or learning level. Written for the 64, we've added a version for the expanded (8K or more) VIC.

Based on the Hangman game idea, "Word Guess" offers more of a challenge, and it's a lot more peaceful (nobody gets hung). The object of the game is to guess the letters that comprise a word which is randomly selected from the program's dictionary (found in DATA statements at the end of the program).

A Limited Number Of Guesses

It sounds easy, but there are a few conditions which make it a bit more difficult. You have only five more letter guesses than the length of the word selected. For example, if a ten-letter word (the maximum length of a word in the program dictionary) is chosen, you have a total of 15 guesses. The number of guesses remaining is displayed throughout each game.

Also, to speed the game along, a maximum of 30 seconds is allowed for choosing a letter. A countdown clock shows how many seconds remain to make a choice.

A correct choice is instantly displayed in its appropriate position (or positions), and all letters guessed are displayed for quick reference. A correct answer is rewarded with a congratulatory message and musical fanfare. If you run out of chances, the answer is displayed. In either case, the total elapsed time in minutes and seconds is displayed after each round. You are also prompted to press f3 to quit or f5 to continue on to another word.

Modifying The Program

Word Guess has 100 words in the program dictionary. None is used more than once in a single game. If you wish to change this number, first change the value of N in line 9. Then change the words in the DATA statements (lines 1000–1100). Be sure the value of N corresponds to the number of words contained in the DATA statements. New words must be from one to ten

VIC And 64 Program Description

Line Number	
9	defines number of words in dictionary (N); time limit (GT)
10	branches to print introduction and instructions
17	defines music POKEs
20	DIMensions the following arrays: **LE$** each letter of word to be guessed **MI$** letters used so far **DI$** correct letters guessed in the word **WU** marker if word was already used **WD$** all words from dictionary **AL$** alphabet
25	reads words in dictionary to WD$, sets WU array to 0
26	reads alphabet into AL$
28	subroutine to clear out arrays for new word
30	picks a random number between 1 and N
35	checks to make sure a word is not repeated in the game
40	marks the word to be used so it is not repeated later
50	finds word length
55	separates letters of the word to be guessed, places letters into LE$
80	PRINTs message to screen
85–90	define beginning screen locations for word display and underlines
102–104	PRINT messages
106	initial time for guessing word
107	gets initial time in seconds for guessing letter
108	obtains guess
109	if no guess entered yet, activates countdown (if no time left, put '-' for guess)
112	checks if length of answer is equal to one
113	checks if guess is a letter from A to Z
115	increments number of guesses
120	places guess in array of guessed letters (MI$)
130	checks if letter in the displayed word has already been guessed
140–145	if guess is in word, place it in the appropriate spot, redisplay the word
170–173	determine POKE assignment for letter guessed
177	determines screen location for guessed letter
180	POKEs the guessed letter onto screen
190	PRINTs number of guesses left
215	if there are no guesses left, and the word is not determined, perform routine for missed words
220	if the answer was guessed, perform routine for correct word
225–230	PRINT function key options
235	waits for a response
240	if f5 was pressed, get a new word
245	if f3 was pressed, clear screen and end game

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Subroutines

300–390	countdown clock for guessed letters
500–540	clear arrays for new word
600–655	display current letter being guessed
620	determines POKE for letter
625	determines screen location for display
630	POKEs the letter onto screen
635–645	sound beep for letter guessed
650	time delay for multiple occurrences of the same letter in the word
700–730	PRINT message for missed word
705–710	print message and the word missed
715–725	sound buzz
800–850	PRINT congratulations for guessed word
810	PRINT message
815–835	sound fanfare for correct guess
875–975	PRINT introduction and instructions
875–897	print introduction
900–956	print instructions
1000–1999	dictionary of words
2000–2010	alphabet

characters in length, and no special characters or numbers may be used. By following these simple rules, it's easy to modify the game for children or even serious word buffs.

You may also change the 30-second time limit by assigning a new value to the variable GT, also in line 9.

To make the game more difficult, add GOTO160 at the end of line 140. This forces the player to guess each letter even if the selected word has more than one occurrence of that letter. For example, if the selected word is "gallon," the player must guess "l" twice to get the correct answer.

See program listings on page 201.

Advertise your program or product for the VIC-20 or 64 here and reach hundreds of thousands of readers.

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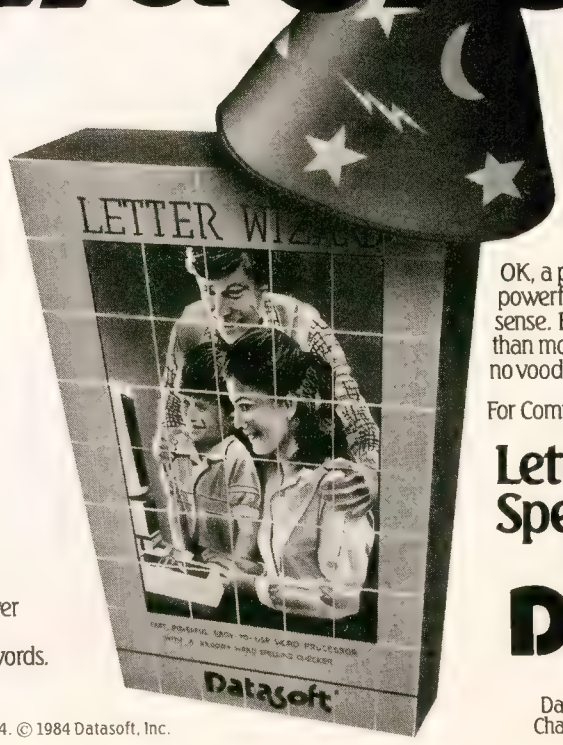

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Letter Attack

Craig Howarth

Keep your typing skills from going down the "chute" with "Letter Attack." Originally written for the VIC, we've added a version for the 64.

This program puts your typing skills to the test. It measures response time and accuracy and provides entertainment as well.

The rules of play are quiet simple. A letter falls down the chute from the top of the screen at varying speeds (depending on the skill level chosen). You must press that letter on the keyboard before it reaches the bottom of the screen. If you enter the wrong letter, you can keep trying until the letter vanishes from the screen.

The Play Screen

The skill level, letters remaining, current score, and high score are displayed during play. In addition to these, a green pointer appears on the right side of the chute every time a letter is properly entered. This shows how quickly you are responding during the course of play. The higher the pointer the faster your response time.

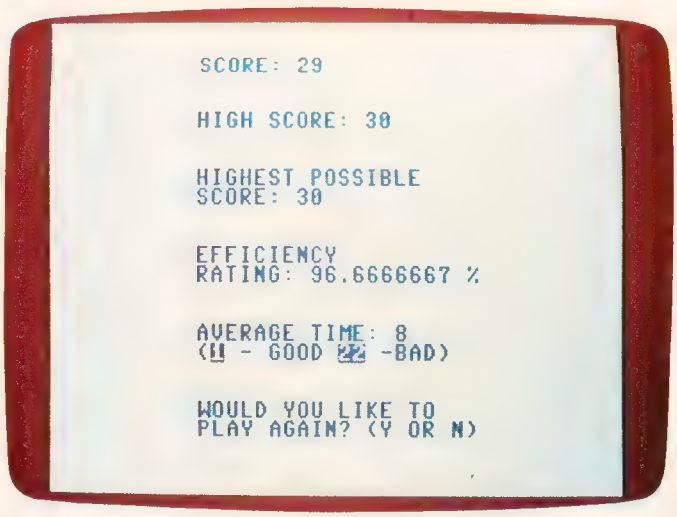
On the left side of the chute, starting with the second round of play, a purple pointer indicates your best response time so far.

The Score Screen

Once all of the letters are eliminated (the number of letters is chosen at the beginning of play, 10–90 in increments of 10), a new screen is displayed showing the results of the most recent game. Along with the score, the highest possible score (number of letters), and the high score, is an efficiency rating which is the percentage of the score against the highest possible score.

There is also an average time displayed, determined by dividing the total of all times for

A letter is caught and marked by an arrow in the VIC version.



Each performance is rated at game's end (64 version).

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correct responses by the score. The lower the number, the better the time.

You are next asked if you'd like to play again. If so, you may choose a higher skill level and more letters.

Variables Used

HS	– High score
BT	– Best time
V	– Volume
S	– Sound (tones)
N	– Noise
DL	– Difficulty level
NL	– Number of letters
SC	– Score
LR	– Number of letters counter
TM	– Time (total)
A	– Screen color code offset (30720 for the VIC)
B	– Screen character code location (7682 for the VIC)
LE	– Letter (POKE code)
LC	– Letter (ASCII code)
CN	– Sound counter
ER	– Efficiency rating
AT	– Average time

See program listings on page 192.

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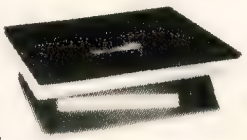

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MicroFiler: A Data Base For The 64

Charles Brannon, Program Editor

If you've been looking for a fast, flexible, and easy-to-use data base program, *MicroFiler* may be well worth your attention. The term *data base* has come to have two meanings. It can refer to a large base of data, or the program that manages the data. A data base program can be a fully programmable data language like *dBASE II*, or a computerized index card file. *MicroFiler* falls into the latter category, but does far more than a glorified file card box.

Unlike disk-based data bases, which dynamically retrieve all records from disk, *MicroFiler* is memory-oriented. The performance of disk-based data bases depends on the speed of the disk drive, whereas a memory-oriented data base is much faster, but limited by available memory to a certain number of records. However, this permits 64 owners who use Datassettes to take full advantage of *MicroFiler*. You initially load all your records from tape or disk, do your entering, editing, searching, and printing, then save the data back out to tape or disk.

Since *MicroFiler* is on cartridge, there's no frustrating delay while the program loads. The cartridge becomes part of the 64's memory, turning your machine into a filing system.

Creative Data Entry

When you turn on your computer, the *MicroFiler* title screen comes up, where you select Create File. A blank screen with a menu bar at the top appears. Here's the fun part. Using full screen editing, you "draw" a form you'll use to enter your data. Reverse-field spaces mark the blanks which will be filled in when you enter data. The number of spaces you type out determines how much memory is reserved for that field in the record. You can type names for the blanks, even embellish the form with graphics characters and color.

This is one of the most flexible ways I've ever seen to create a data entry form. When entering data, you're not required to place these entries into all fields. If you want to enforce entry, place a reverse-field C in the first spot in the field. Numeric fields, which can be summed and averaged, are specified with a reverse-field N. *MicroFiler* won't let you enter an illegal number in a numeric field.

Entering your data is just as easy. The cursor up/down keys move directly from field to field. You can only type into the reverse-fields you earlier prepared. Full cursor editing is supported within each field. After you've entered a record, press f1 to store it. Since there are only 1000 characters in a 40 × 25 screen, this is the limit of how big a record can be. With labels and prompts, you have even less room. However, if you use short records, you can, of course, have many more in memory.

After you've entered some data, you can scan through the records. If you're using *MicroFiler* as a recipe filer, you may want to find the lasagna recipe. Instead of scanning through all the records, you can search for the name of a recipe. Or perhaps you're keeping a mailing list, and would like a display of all clients located in your home state. You just enter certain search characters within the field(s) you want to search or combine searching and sorting as you view your records. You can also generate a sum or average of all numeric fields.

Designing A Printout

If it's hard copy you want, *MicroFiler* lets you enter certain

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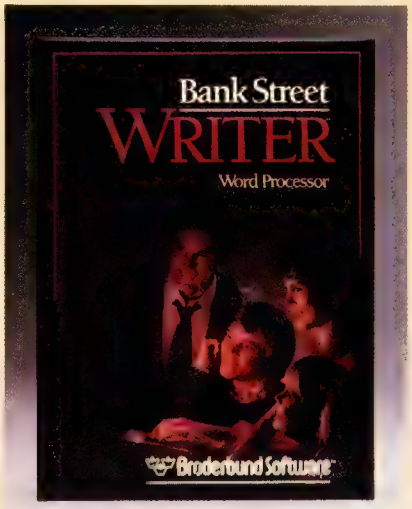

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characters into the fields, describing the printout in terms of fields included, the order of fields, how many spaces between fields, and the location and number of carriage returns.

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MicroFiler does have some limitations. Since the number of records is limited by memory, you may need to keep several separate data bases with the same entry form. You cannot add an extra field or change any part of the entry form without losing all your data. (Many data bases have this limitation.) There is no way to print column heading or field names with the data, or to print headers, footers, or page numbers. Other than summing and averaging, no math operations are supported on numeric fields.

Nonetheless, *MicroFiler* has rare power for such an easy-to-use program. The ease with which you define and enter records and the flexibility of sorts, searches, and printouts all make *MicroFiler* stand out against the glut of inferior data bases. You might not want to use *MicroFiler* for complex business record keeping, but it will do an outstanding job for casual or home applications.

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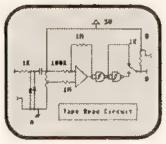

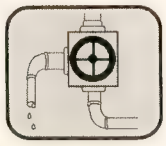

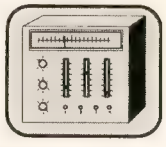

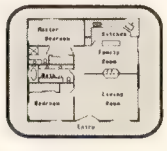

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NATO Commander

Art Hunkins

NATO Commander, from MicroProse Software, is an accessible, single-player war-game simulation that quickly gets you deeply involved. And it's fun to play. The basic commands are easy to learn (one-and-a-half to two hours should do it), and its main challenge is strategy. An "accelerated real-time combat simulation" (action is updated in 5-minute chunks), it pits NATO vs. Warsaw Pact forces, with you as NATO chief.

Scenarios are based on actual and anticipated European theater strategy, including what is known of Warsaw Pact strengths and weaknesses, NATO reinforcement readiness, and France's intentions (should war break out).

A Pause To Reflect

The game's chief attraction is its ability to let you *freeze* action—a kind of "time out" to survey the situation, plan strategy, and make any moves you desire. Since *freeze* can be activated at any time, action can best be described as unstructured and free-flowing; you as commander can interrupt, interact, and change strategy whenever you want. This tactical immediacy is both captivating and realistic. So is the political dimension: Scoring includes both combat and political elements (use of nuclear weapons scores negative political points).

Strategy is of necessity defensive (although one of five scenarios involves a pre-emptive first strike); tactical nuclear weapons are strictly a last resort, for use only when conventional remedies have failed or when the enemy has first gone nuclear—and then only after authorization from the commander-in-chief. To win, you must both keep up your guard (defend your cities), and employ your forces appropriately (each force type specializes in a particular role).

The game offers numerous options and many types of armed forces (there are multiple kinds and functions of units). In addition to the five scenarios, the game comes up in "demo mode," a feature purporting to make it more accessible to first-time players. Other noteworthy features include daily status reports, interspersed with announcements of political events which affect game action (based on historical probability).

Each military unit is "intelligent"; it does its own reconnaissance, choosing its own most favorable course of movement (this particularly applies to Warsaw Pact forces). Radio and teletype messages link you with your various units, and your access to the field is immediate.

The graphics are good, though basic. A joystick moves you around the display map, which shows water, rivers, terrain features and towns, as well as the various forces. A particularly nice, though occasionally disturbing, feature is the shift from day to night—from light to dark background. Action is slow and difficult following the dramatic shift to black. On the whole, color is particularly effective in helping identify both forces and terrain features.

A Few Drawbacks

The documentation is sketchy to average. The vital information is all there, but not all the screen action and graphics are explained. Nor (in sufficient depth) are the roles of morale and terrain.

The map graphic is surprisingly difficult to follow and figure out, even when used with the map included in the documentation. Then there are the all-too-frequent misspellings and syntax errors, coupled with poorly formatted text that splits words between lines. The documentation still shows traces of conversion from the Atari original.

Nevertheless, as a one-player simulation, *NATO Commander* is both exciting and realistic. It is relevant to today's political climate, since it plays according to

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the "rules" of the European theater of the '80s. Although it offers multiple levels of difficulty, it can be approached by first-time war gamers, and gives some notion both of contemporary command strategy and the challenges, intricacy, and immediacy of modern warfare in the West. *NATO Commander* has interactive excitement, the realism of today, and considerable staying power. Recommended for those who want a different kind of contemporary war game, and for the adventurous novice war gamer.

NATO Commander
MicroProse Software
10616 Beaver Dam Road
Hunt Valley, MD 21030
$34.95 (Commodore 64 disk)

Road To Moscow

Neil Randall

On June 22, 1941, Hitler invaded the Soviet Union. The next four years saw the largest land campaign ever fought, as the Germans pushed the Soviets to the brink of surrender and then began the long, slow retreat to Berlin. To the Allies, it was known as the War in the East; to the Soviets, the Great Patriotic War. To the Germans, it was simply the Russian Front.

Road to Moscow for the 64 is a re-creation of the entire Russo-German war. The screen displays a map of the Soviet Union from Poland to the Ural Mountains (west to east) and from Finland to the Black Sea (north to south). You're given command of the German forces, which you must maneuver using either the keyboard or a joystick. To win the game, you must capture as many Russian cities as possible, then hold on to them. The Soviets (your 64) will do everything possible to stop you. Each turn represents two weeks of real time.

Graphic Realism

On the map of the Soviet Union, you see five types of terrain: forest, swamp, mountains, seas, and clear. Each has a distinct graphics symbol, and each is appropriately colored. The map changes color with the seasons: light gray during clear weather (summer and fall), yellow during spring, and a very stark white throughout the long Russian winter. This last change has an interesting psychological effect, as you soon come to dread winter as much as the Soviet army.

The armies themselves consist of small square "units." You can choose standard designations (for example, infantry is a square containing an X), or icons, which show a picture of the type of unit (infantry is a little man, armour is a tank). German units are black, changing to light blue when less than half-strength. Russian units are red, changing to pink when depleted. The cities on the map change color to indicate who last occupied them.

All in all, the graphics are very attractive. Because everything happens on only one screen, though, the units are a bit small to be comfortably focused on for more than a couple of hours at a time. The game is playable on a black-and-white TV or monochrome monitor, with little trouble distinguishing shades.

A Choice Of Scenarios

Road to Moscow has five scenarios. Four of them cover individual years of the war, and one the entire campaign. The 1941–42 scenario takes the war from the German jump-off point to the battles near Stalingrad. At the other extreme, the 1944–45 scenario shows the last, desperate German defense of Poland. The campaign game covers the war from start to end, and is the one you'll want to get to as soon as possible.

The small scenarios take about five hours to play, once you have a few hours experience. The campaign game is an undertaking of 20 to 30 hours. The program disk allows one game to be saved on it, however there is no provision for saving a game on a separate disk.

Game play is unusual in that both sides move simultaneously. First, using the joystick or keyboard, you plot movement for each German unit. While you're doing this, the computer is plotting movement for the Soviet units. When you

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finish plotting, type G and the computer performs the actual movement of both sides' units. Whenever enemy units are plotted to enter the same square, they fight.

When you "pick up" a unit, a one-line display at the bottom of the map shows the unit's current strength, potential strength, and current supply status. Units which are depleted can be taken out of the line and into a city to receive reinforcements. The supply status is a number from 0 to 9, with 9 meaning full supply and 0 indicating that the unit has been out of supply for two months. A unit with low supply takes heavier casualties, cannot move at full speed, and cannot receive replacements. In other words, it's in trouble.

A unit is moved with either a joystick or the function keys. You simply pick up a unit, plot where you want to go, then drop it. You may change its move at any time. Even if you use a joystick, the function keys are available for such purposes as identifying cities and changing movement plots. Strangely, I find keyboard control easier than joystick control.

Simulating History

Road to Moscow handles all the major aspects of the Russo-German war. The Germans are immensely superior to the Soviets in effectiveness for the first part of the war, but the Soviets keep getting better. The player watches as Soviet reinforcements and replacements keep coming and coming, always seeming to fill the gaps at the last moment. Russian artillery appears in mid- to late-1943 and smashes anything that stands in its way. You must use your armored units to sweep around and trap the Soviets; if you try to go right through them, you'll suffer too many losses.

There is even a series of Strategic Events, happenings beyond the player's control. As an example, the game may begin six weeks early (May 1941) to reflect what might have happened had Hitler not conducted a Balkans campaign before invading Russia. Historical events include the invasions of Italy and France, both of which siphon off troops from the Russian front. These events are introduced by the computer, and they interact with each other.

What is most impressive about *Road to Moscow* is its sense of focus. Wars are complex affairs, and a game cannot simulate every aspect of even a small war. The players must be cast in a historical role, be it tank commander, brigade commander, or commander of the entire war.

Road to Moscow places the player in the role of German strategic commander (historically assumed by Hitler). He is free to do with his troops as he will, but he is under the historical constraints of time, weather, and manpower. Unlike many war games, though, *Road to Moscow* makes the player's role very clear. He is not concerned with small-unit tactics, not even with small battles. He must deal with overall troop movement, and that's it. The game reminds me of military maps, with troop movements shown by arrows. The arrows show where the commander hopes the units will end up, which is what this game's plotting system does for the player.

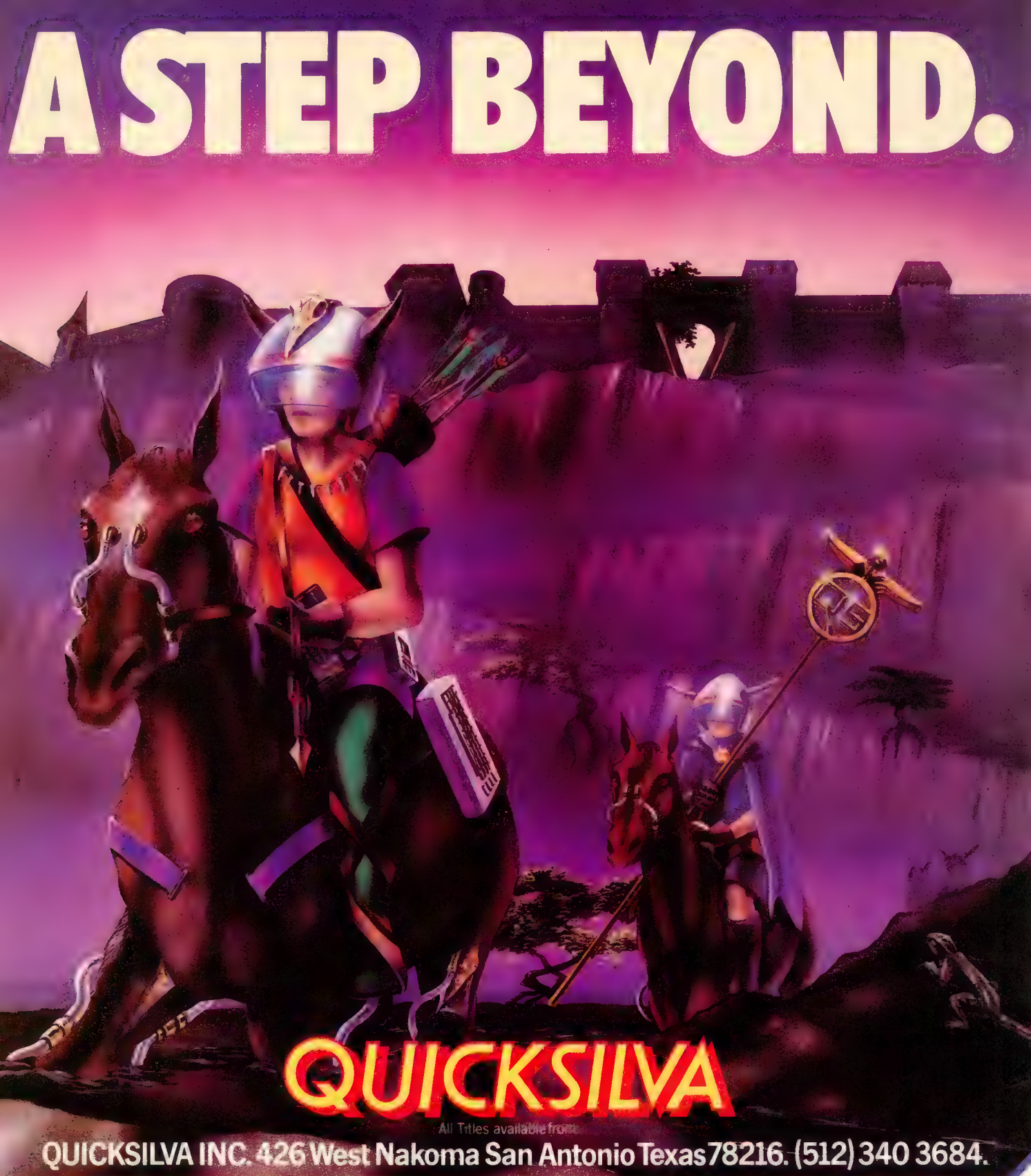
Nothing's Perfect

Despite its overall success, however, there are a couple negative points. Allowing only one game to be saved is inconvenient, and writing it to the game disk seems a little dangerous, should anything go wrong. If you forget to turn on the drive before saving the game, you lose it and must start over from your last save. Surely a warning message could show up instead. It would have been nice to allow units to move diagonally, since doing so would permit a more gradual (and safer) retreat. (Since units are joystick-controlled, I think this would have been both logical and effective.)

Finally, I would like to have seen a more explicit way of showing when units are destroyed. As it stands now, the computer flashes the unit's name on the status line, but it is almost impossible to tell which unit has just been eliminated. A better handling of this would help the player learn how to fight battles more efficiently.

More importantly, the documentation is a little vague on how the game actually works. I suspect this is intentional, the idea being to learn as you play. But war gamers tend to be an analytical lot, and want to know how the computer conducts

A STEP BEYOND.



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combat and where it gets its numbers. The game uses a system different from other computer war games, and should therefore be explained in greater detail. Since Ba'rac plans other games using this system, perhaps we'll see more explanation.

Road to Moscow is one of the best computer war games available, for two main reasons. First, it uses a system which plays quickly and yet allows the player to feel like a theater commander. Second, it simulates one of the most interesting wars of all time. For these reasons, and because it does its job differently than other computer war games, I recommend it to both beginner and veteran.

Road to Moscow
Ba'rac Limited
P.O. Box 37206
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$29.95 (disk)

Also Worth Noting

The Castles Of Dr. Creep

Thirteen castles, over 200 rooms, countless passageways, and legions of creatures make this arcade game for the Commodore 64 one that plays for days, not just hours.

After selecting the castle you want to explore (there's a tutorial game that quickly shows you how to play and illustrates the different elements of a castle), your character appears in a room. Sometimes you have but one possible exit, because the other doors are locked or simply cannot be opened from this side. Other times you have a choice. Running through a doorway and up the passageway (graphically entertaining in itself), you find yourself in another room.

But there are electrostatic generators (remember the huge silvered balls, with lightning sparking off them, from the old horror movies?), matter transmitters, force fields, trap doors, moving sidewalks, automated death rays, ladders, fireman's poles, and walkways filling each room. To make things even more complicated, Frankenstein monsters and stumbling mummies leave their coffins and tombs and follow you almost everywhere. The combination and number of these devices and creatures sets the difficulty of the room.

Each room is a puzzle in itself. How can you get to the generator switch when a Frankenstein bars the way? How can you close that trapdoor without electrocuting yourself?

And the rooms comprise a greater puzzle—the castle itself. You somehow must escape. To do that, you have to find and pocket the numerous keys scattered throughout the building. Only then can you find your way back into the light.

The Castles of Dr. Creep is an entertaining, engrossing game that manages to combine arcade action, superior graphics and sound, and strategic puzzle solving. You need quick thinking, and even quicker reflexes to find your way out. And with two players, one at each joystick, it becomes a medley of competition and cooperation. Transylvania was never so hard to leave.

Brøderbund Software
17 Paul Drive
San Rafael, CA 94903
$29.95 (disk)

Dragon's Keep And *Troll's Tale*

These two new children's adventure games for the 64 from Sierra are teachers as well as entertainers. Both are graphics/text adventures in which the player travels from scene to scene, following clues, to locate missing objects. In *Dragon's Keep*, the object is to rescue animals, in *Troll's Tale* to find hidden treasures. Each game has good graphics, and the constant disk access, common to most adventure games, doesn't cause too long a wait. Each package includes maps and stickers to help the child visualize and track his or her movements.

The skill focus of these adventures is on identifying details, understanding inferences, and drawing conclusions. *Dragon's Keep* is designed for ages

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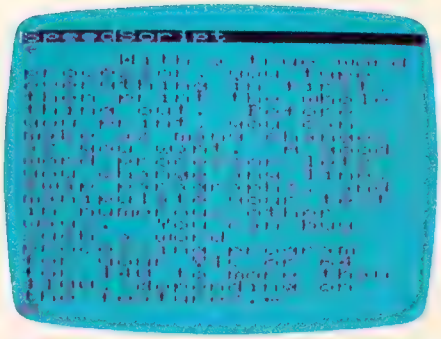

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seven and up and teaches compass directions. *Troll's Tale* is a bit more complex and is designed for ages eight and up.

Both games are well designed and fun to play. Just as importantly, they don't get in the way of the interactive process. No matter what choices a youngster enters, the programs provide guidance to those who may get frustrated, and they teach important skills.

Sierra, Inc.
P.O Box 485
Coarsegold, CA 93614
$29.95 disks

Rug Rider

You'll need to develop a deft touch with the joystick to take full advantage of this new action game from International Tri Micro. Very much in the tradition of *Joust*, *Rug Rider* puts you in command of a free-floating magic carpet piloted by a red-robed, turbaned character, Ahmed. You fly among clouds, caves, forests, mountains, and castles collecting power and experience for the final confrontation with the Evil Genie.

Rug Rider lets you scroll and choose any of 32 screens, each with different terrain and challenges. Colorful graphics, sprightly music, and a variety of obstacles help keep the game lively. As with almost any good action game, mastering the joystick movements takes a bit of practice. It is particularly important that you not let Ahmed come in contact with objects on the screen, such as the bottom of a cloud or any of the lethal instruments of destruction.

In each round, you gather all of the keys on the screen, freeing the treasure for you to take. By using the space bar, your character can fire bolts of magic at the Evil Genie and lesser threats. This is an awkward component of the game, however, and in practice is difficult to use effectively.

Rug Rider includes a good mix of activities on the different screens. Sometimes you'll need to drill for the magic keys. On other occasions, you'll have to pick up and drop heavy irons, or brandish magic shields. Destroying the Evil Genie is the toughest part of a very challenging game. You'll have to hit him with your magic bolts more than once to achieve the desired results.

International Tri Micro
1010 N. Batavia Unit G
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(714) 771-4038
$29.95 (disk)

Impossible Mission

From the moment you hear the sinister voice of Dr. Elvin Atombender welcome you to his underground stronghold, you know this new action-puzzle game from Epyx is something refreshingly different. Fast action, superb graphics and sound effects (including speech synthesis), a somersaulting central character, and a difficult code for you to crack make *Impossible Mission* a game you can come back to and still enjoy.

As a special agent attempting to stop Atombender from destroying the world, you run through the tunnels and ride the elevators of his headquarters seeking pieces of code, which are the keys to preventing annihilation. More than 30 rooms must be searched, and 90 robots have to be circumvented while you gather parts of the puzzle. As you pick up the code, the pieces are automatically transferred to your Agency's computer, which will help you unscramble the meaning. But it's by no means easy. Look at the pieces, flip them vertically or horizontally, match their colors. Call the computer for help. Hurry, time is running out.

There are numerous subtle touches which make *Impossible Mission* unique. The sound effects are extremely well done, including Atombender's taunting comments, a chilling cry if your character plunges to his demise, the robots' electrifying zaps, even the footfalls as you run through the tunnels and the rooms. Two code rooms permit you to pick up "snooze" passwords (which temporarily stop the robots) and "lift inits" (which reset the elevators in a room) if you can correctly remember a sequence of musical tones.

If time runs out before you've solved the code, Atombender's mocking laughter will haunt you as the screen breaks up in destruction. Each time you play the game, it generates a different pattern of rooms and a variety of codes for you to break. This game presents an excellent combination of features which takes full advantage of the Commodore 64's capabilities.

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Programming Commodore's Magic Voice

Betsy And Danny Byrne

Commodore's new Magic Voice Speech Module gives your 64 the power to talk. Here's a short program that acts as a "speech processor." You type the words and your computer speaks them.

Making your 64 talk to you is a simple matter now. Commodore's Magic Voice Speech Module is easy to use, and it can greatly enhance your programs with educational and entertainment value.

For starters, just plug the Magic Voice cartridge into your 64, hook a wire to your TV or monitor, and turn on the computer. Type SAY and one of the 234 available words, and your 64 is in business.

You can insert any cartridge software into the top-loading slot. Certain games, like Commodore's *Gorf* and *Wizard of Wor*, have some speech routines built in. *Gorf* guffaws (or is it a chortle?) as the game begins, "Ha Ha Ha, Space Cadet." It adds a new dimension to game playing.

Writing Your Own Voice Programs

If you're able to understand and manipulate the PRINT statement, you should have little trouble using SAY.

You can SAY a word directly, as long as you spell it correctly and put it inside quotation marks. Or you can use the word number (the number which represents a word from the available list), which saves some memory if you plan to speak a lot of words in your program. For example, SAY"MILLION" is equivalent to SAY18, because word number 18 is "million."

Besides SAY, the Magic Voice module adds two other new BASIC statements and a new reserved variable. RATE sets the speed of the words spoken. It doesn't make the pitch higher (like a cartoon character) or lower; it makes the words come out faster. VOC is a specialized statement for use with extended vocabularies (which are not yet available as this issue goes to press). And RDY is a variable which keeps track of when the computer has finished one word and is ready to say another.

The manual includes a short program to allow the computer to speak every number from 0 to 999,999,999 when typed from the keyboard. But what if you want a program to speak the other words when they're typed in?

There are several problems that must be solved before a "speech processor" is possible.

Probably the most serious problem is the 234-word limit of the Magic Voice. It's not that it's a strange or useless vocabulary. It does contain most of the most common words. The difficult part is that, unless you've memorized the list of words, it's easy to type a word which the Magic Voice doesn't know. What happens then is the program stops and prints an ?ILLEGAL QUANTITY ERROR message.

In addition, the Magic Voice does not recognize sentences. You have to SAY words one by one. As you type sentences, the program has to watch for individual words. That's simple enough, just GET letters from the keyboard, building up the word until you reach a space (marking the end of a word). Then SAY the word and go back to get the next one.

Finally, there are some homonyms not on the list. We'd want the program to swap between homonyms if one is on the list but its counterpart isn't. For example, if you tried to SAY the words DOWN BY THE SEA, you'd hear the first three. But SEA would result in an illegal quantity error, even though the Magic Voice can say the letter C and the word SEE. Another problem is with alternate spellings, for example GREY (acceptable) versus GRAY (not).

Using Finger Talk

"Finger Talk," the program accompanying this article, addresses some of these quirks.

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was to include lots of DATA statements to cover 230+ words and various homonyms. The numerous DATA statements contributed to the length of the original program.

Finger Talk was shortened considerably by a slight modification to the error routine. If you look at line 80, you'll see three POKEs. They divert the Magic Voice module's error routine to a harmless section of memory. If you try to say an illegal word, the Magic Voice just ignores it. The program continues, instead of stopping and printing ?ILLEGAL QUANTITY ERROR.

If you own a Magic Voice and plan to write programs for it, you might want to make note of the three POKEs, especially if you plan to SAY words which are INPUT by users.

The second problem, speaking words instead of sentences, is solved with the GET statement, as described above.

Several homonyms have been added. You can see them in the DATA statements toward the end of the program. They are stored in an array. When you type an illegal word which sounds like a legal one, the program trades the two and the equivalent vocabulary word is spoken.

Typing In The Program

Type in Finger Talk and save it. Before you run it, make sure you have the Magic Voice module plugged into your 64. As the program begins, the homonyms are read into memory and the title screen appears.

You are asked two questions. If you want each letter spoken as you type, answer YES to SAY EACH LETTER? For example, if this option is active, you will hear T, H, R, E, E when you press those letters. Press the space bar and you'll hear the word THREE. If you answer no, you'll hear only the word, not the individual letters.

You also choose what RATE the Magic Voice will use, from 1 for the fastest to 10 for the slowest.

After you answer the questions, the main speaking routine begins. If you type a word that's part of the Magic Voice's vocabulary, you'll hear it spoken. If the word isn't available, you don't hear anything. Press RETURN and the whole sentence is spoken.

Finger Talk limits sentences to 80 characters (two screen lines). If you reach the 80th character without pressing RETURN, the computer automatically says the sentence as if RETURN had been pressed.

The f1 key controls the RATE (1–10) from within the program. Each time you press f1, the rate is increased by 1. A single number in the upper left corner tells you the current rate (a zero means rate ten). If you make a typing mistake, you can use the DELete key to correct it. And SHIFT–CLR/HOME clears the screen. It doesn't matter whether you use upper- or lowercase letters; they're converted to lowercase by the program.

One thing to watch for is typing a space while the SHIFT LOCK key is down. Spaces are used to mark the boundaries between words, and the SHIFTed space character is different from a regular space. They look the same on the screen, but have different ASCII values. A SHIFTed space is like a capital space, if you can imagine that. It's best to avoid using SHIFT LOCK when entering words to be spoken.

One other quirk comes from the way words are kept in an array until you press RETURN. If you type a few words and clear the screen (without pressing RETURN), the previous words will be spoken when you finally do press RETURN. The array is active until RETURN is pressed.

Finger Talk demonstrates what the Magic Voice module can do (and gives you something for your friends to "ooh" and "aah" over at parties). It could be useful to teach touch typing to blind people; they'll hear which key they just pressed. And kids who are learning to read could use it to practice.

See program listing on page 197.

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Cosmic Combat

Tommy Graham

Wave after wave of enemy Zirconians attempt to descend on your home planet in hope of the ultimate conquest. Your only defense is your particle beam pulsar cannon, which will destroy them. But don't even let them get close—they'll self-destruct and take you along with them. An action game for the VIC and 64. Joystick required.

Alien visitors from a faraway galaxy have left their dying planet in search of a new base for their civilization. Their target: Earth. As they descend in waves, your mission is to carefully maneuver your nuclear-powered space cruiser, which is armed with a particle beam pulsar cannon.

Although you're greatly outnumbered, effective use of your powerful cannon can offset this disadvantage. A direct hit disintegrates an enemy ship. Unfortunately, the Zirconians know of your weapon and are artful dodgers. So much so, in fact, that they'll sometimes collide with each other in an effort to avoid your pulsars.

The Zirconian ships have no weapons to return your fire, but each has a self-destruct mechanism on board. When a ship reaches a certain depth, this device activates and explodes. If you're in the vicinity, your ship, too, is a victim. Fortunately, you have two extra space cruisers in reserve. If these are destroyed, it's all over.

Straightforward Operation

You must first choose one of five skill levels. Use the joystick to move your ship left and right, and press the fire button to shoot your pulsar cannon. You receive 100 points for each Zirconian ship destroyed, but 20 points are deducted for each ship that reaches the ground.

There are innumerable waves of attack forces. When you clear one, the program displays

Programmer's Notes: 64 Version

Gary Black, Editorial Programmer

Program 3, the 64 version of "Cosmic Combat," is written entirely in machine language, so the action is very fast. As in the VIC version, you move your ship with the joystick (port 2) and blast away at the descending Zirconians. Because the game is fast at the start, there is only one skill level.

As in the VIC version, you receive 100 points for each destroyed Zirconian. However, you lose only ten points for each ship that touches down.

Typing in this version requires the use of MLX, elsewhere in this issue. Be sure to read and understand the MLX article before entering Cosmic Combat. When MLX prompts you for a starting and ending address, respond with 49152 and 51479, respectively. Load the program with LOAD *"filename"*,8,1 (for disk) or LOAD *"filename"*,1,1 for tape. To begin play, type SYS49152.

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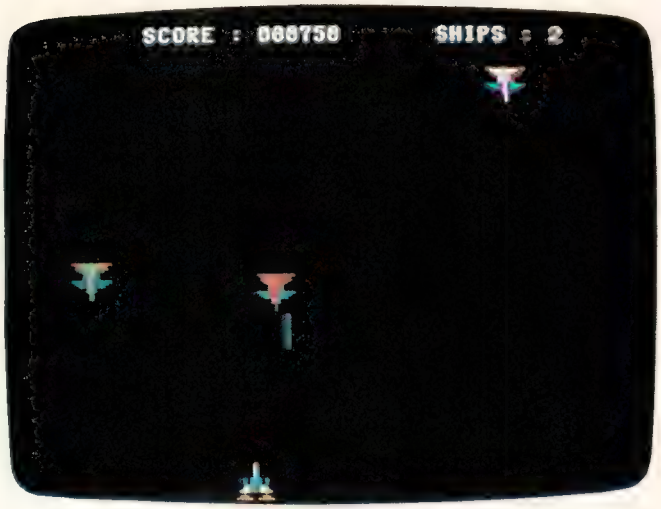
the number of waves you've eliminated. The longer you play, the more difficult the game. My highest score is 62,840. As a challenge, see if you can top this.

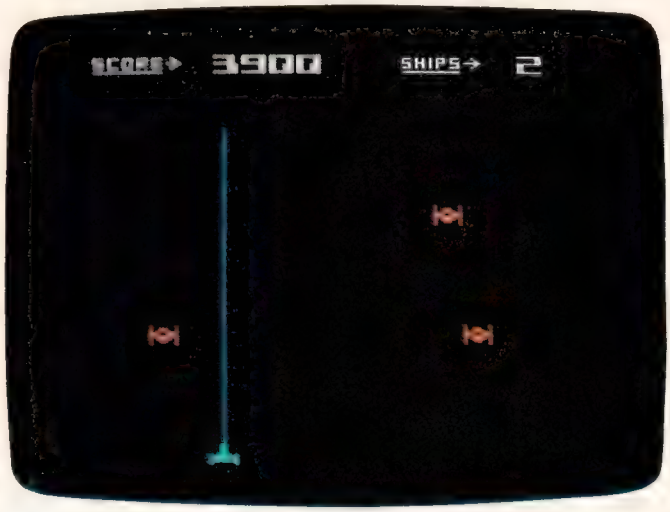
Typing In The VIC Version

The VIC version of "Cosmic Combat" is in two parts. Program 1 POKEs custom characters into memory and automatically loads and runs Program 2. If you're using tape, change the 8 to a 1 in line 19 of Program 1. Save Program 2 directly after the first program. Both disk and tape users should be sure to save Program 2 with the filename CC.

See program listings on page 188.



Defend your planet against the kamikaze Zirconian ships (64 version).



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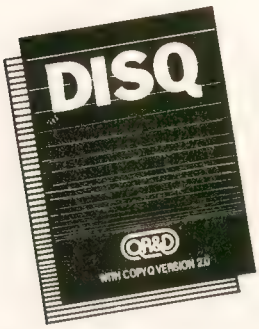

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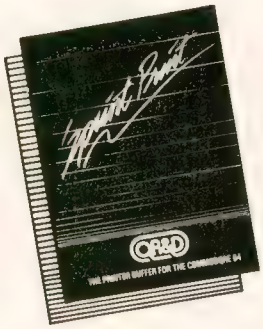

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3-D Labyrinth

This game is a classic example of how a challenging game with good graphics can be written without a lot of code. It runs on the VIC (with or without expansion) and the 64.

Your goal in "3-D Labyrinth" is simply to make it through the maze. Sound easy? It isn't. You start in the northwest corner and must make your way to the exit in the southeast corner. The maze is different each time you play, so tracing your path in one game won't help when you play the next one.

If you're feeling lost, press H (for Help) to get a brief top view of your position in the labyrinth (VIC screen).

A Leisurely Stroll?

If you choose to just explore the maze, you can take a leisurely stroll, carefully plotting your course, and all in your own good time. Or you can play competitively by timing your trip through the maze and then seeing if you or a friend can beat that time in another game.

After typing in and saving the program, simply load and run. The screen blanks while the program constructs the maze, so you'll have a brief wait before the game starts. You begin in the northwest corner, where the wall is marked START. (The southeast exit is marked FINISH.) To *face* any direction, press S, N, E, or W. Throughout the game, the current direction is displayed lest you forget which way you're looking. To *move* in the direction you've chosen, press the space bar. You might want to use graph paper to map your moves.

If you start feeling hopelessly lost, help is at your fingertips. Press H to get a brief top view of the maze with your current position marked. If you're still unable to find your way out, press Q (Quit) to start again in a new maze.

When you make it to the FINISH marker, you must take a step south (S) out of the maze to win the game. You'll then be given the time used to complete the tour and a map of the maze.

Programming Techniques

When I first wrote the program, I used POKEs to the screen. But after changing the POKEs to PRINTs, the game became faster and more memory efficient.

First, the background is PRINTed—in this case, a giant X with smaller pictures laid on top. This X represents the main corridor without any connecting (side) corridors. The computer then looks at the maze (created by an array) in the direction you are facing, and adds pictures of the appropriate side corridors. It first looks to the right and left to see if there are any side corridors. If so, the appropriate picture is PRINTed on either or both sides of the X.

Next, it checks to see if there is a wall in front of you. If so, it PRINTs the proper-sized square centered on the X. The size is determined by how far away the wall is from your present position. If there is no wall, the computer then

For Commodore 64

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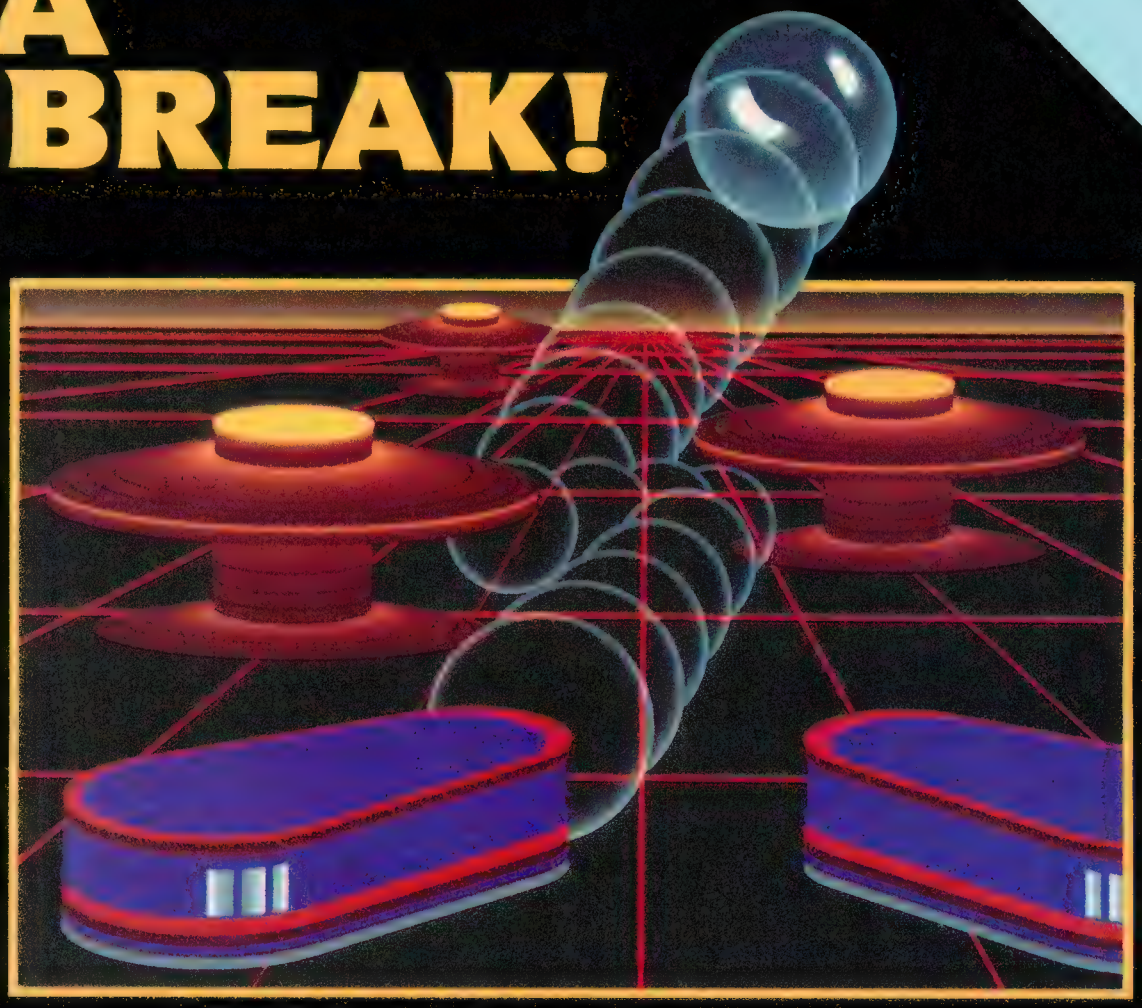

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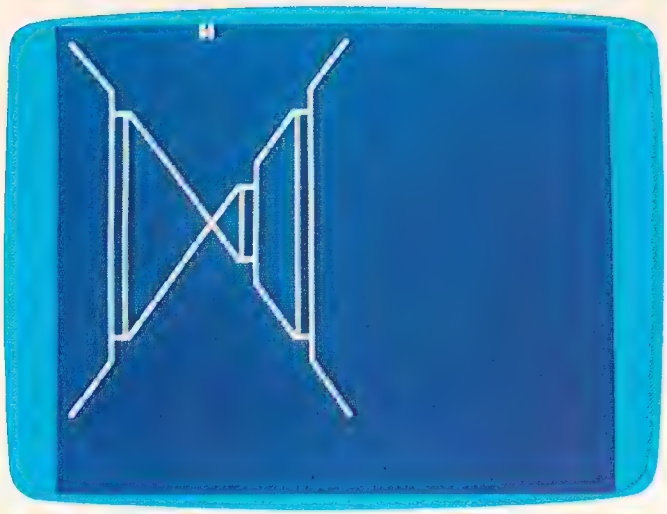

The player faces west with corridors ahead to the left and right (64 screen).

looks ahead two squares for two more side corridors. The program continues until the computer has looked five squares away from your current position.

After this process is completed, all of the individual pictures have overlapped in such a way as to simulate a 3-D effect.

As written, the goal is to simply finish the maze in the shortest time. Ambitious BASIC programmers might want to add some twists, perhaps a series of mazes with monsters, treasures, or puzzles to solve along the way.

Note To VIC Users

If you're typing the program into an unexpanded VIC, be very careful not to add any extra spaces as you enter the lines. The program just barely fits as is, with only a few bytes to spare. Any extra spaces could cause an OUT OF MEMORY ERROR.

See program listing on page 196.

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Michael S. Tomczyk

A Christmas Assortment

This month, we'll build a Christmas program with techniques learned in the previous two columns, and introduce some new programming tricks.

Most experienced programmers have a secret collection of programming tricks—simple techniques picked up over many years of trial and error, or learned from more advanced programmers. In the spirit of the holiday season, let's look at a Christmas assortment of simple tricks which are easy to code and can add a lot to your programs.

These examples work for the VIC, 64, and the new Plus/4 and 16.

Our "tricks" include a brief explanation of how CHR$ codes are used, followed by some simple sound effects you can add to your BASIC programs, and, finally, a way to freeze your program until the user presses any key, or a specific key.

Let's start with one short program and build it up using some "Christmas magic."

Using CHR$ Codes

First, look up the CHR$ codes in the back of your owner's manual. They're listed in the ASCII and CHR$ Codes chart in the appendices of your manual or *Programmer's Reference Guide*. As you can see, every key and symbol on your computer keyboard has its own CHR$ value. For example, the CHR$ number for the club symbol (like on a playing card) is 120. To see how it works, type these lines and press RETURN after each line:

```
PRINTCHR$(120)
FOR X=1TO22:PRINT CHR$(163);:NEXT
PRINT CHR$(28)"THIS IS THE COLOR RED."
```

The first line prints one "club" symbol on the screen. CHR$(120) is exactly the same as the club symbol.

The next line uses a FOR–NEXT loop to PRINT the CHR$(163) symbol 22 times. As you may recall from our previous lesson on FOR–NEXT, everything between FOR X=1 TO 22 and NEXT will be repeated 22 times. In this case, CHR$(163) is the CHR$ code for a horizontal line, so the horizontal line is printed 22 times. The semicolon causes all the symbols to appear right next to each other. Without it, each symbol would be printed on a separate line.

You can also use CHR$ commands to change colors, as we did in the third line above, or to switch between upper- and lowercase.

Now, let's see how we can use a CHR$ to clear the screen:

```
100 PRINT CHR$(147)
200 PRINT"PLEASE TYPE YOUR NAME AND PRESS
    RETURN.":INPUT N$
300 PRINT CHR$(147)
400 PRINT"MERRY CHRISTMAS, "N$
```

Type RUN and press RETURN, then follow the instructions on the screen. Let's see how this program works:

Line 100 clears the screen. Printing the CHR$(147) is the same as printing the "clear screen" character (SHIFT–CLR/HOME).

Line 200 prints a message on the screen. The INPUT command tells the computer to put a question mark on the screen, wait until something has been typed, and then assign the variable N$ to stand for whatever was typed. For example, if you typed your name, the variable N$ is the same as your name.

Line 300 clears the screen again so the second message in line 400 appears all by itself.

Line 400 prints the MERRY CHRISTMAS message, followed by your name. Notice that N$

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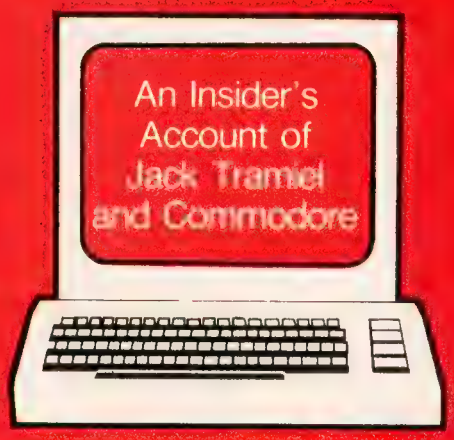

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is *outside* the quotation marks. Variables are always used outside quotation marks. The comma, however, is *inside* quotation marks, so it will be printed as the comma character. Try putting the comma outside of the quotation marks, just before N$.

REM: *In our first program example, we numbered the lines 100, 200, 300 because numbering the lines by 100 lets us insert more lines later on. Most programs are numbered by tens—10, 20, 30 and so on—but if you think you might add a lot of lines later, it's a good idea to number your lines by 20, 50, or even 100. The highest line number allowed is 63999, so you have plenty of room to work with.*

Creating Sound Effects In A Line Or Two

Did you ever write a program and wish you could include just a simple "bleep" or other short sound effect? Let's see how easily this can be done. Below are simple one and two line statements you can use in your own programs. Find the one appropriate for your computer, type it in, and press RETURN.
For the VIC:

```
150 POKE 36878,15:POKE 36876,160:FOR T=1T
    O200:NEXT:POKE 36876,0
```

For the 64:

```
150 POKE 54296,15:POKE 54276,33:POKE 5427
    7,9:POKE 54278,0
151 POKE 54273,51:POKE 54272,97:FOR D=1TO
    200:NEXT:POKE 54276,0
```

For the Plus/4 and 16:

```
150 VOL 7:SOUND 1,460,60
```

After typing the sound effect line for your computer, type LIST and press RETURN to make sure the sound effect line has been added to your program. For example, if you have a 64, your new program should look like this:

```
100 PRINT CHR$(147)
150 POKE 54296,15:POKE 54276,33:POKE 5427
    7,9:POKE 54278,0
151 POKE 54273,51:POKE 54272,97:FOR D=1TO
    200:NEXT:POKE 54276,0
200 PRINT"PLEASE TYPE YOUR NAME AND PRESS
     RETURN.":INPUT N$
300 PRINT CHR$(147)
400 PRINT"MERRY CHRISTMAS,"N$
```

Now, type RUN and press RETURN to see how the program works. (Make sure the volume control on your TV or monitor is turned up.) Presto—you've just added sound to your program.

Using GOSUBs To Repeat A Sound Effect

You can repeat a sound effect as many times as you like, but if you use it more than once, you'll probably want to use a GOSUB command with a RETURN.

The GOSUB command tells the computer to GO to a SUBroutine, execute that routine, and then when it's done, RETURN to its original position and continue on with the program. Using the GOSUB command means you can jump down to a program line and use it over and over again. The obvious advantage to using this command is that you don't have to retype the line every time you want to use it. Here's how it would work with the 64:

```
50 GOSUB 990
100 PRINT CHR$(147)
200 PRINT"PLEASE TYPE YOUR NAME AND PRESS
     RETURN.":INPUT N$
250 GOSUB 990
300 PRINT CHR$(147)
400 PRINT"MERRY CHRISTMAS,"N$
450 GOSUB 990
900 END
990 POKE 54296,15:POKE 54276,33:POKE 5427
    7,9:POKE 54278,0
991 POKE 54273,51:POKE 54272,97:FOR D=1TO
    200:NEXT:POKE 54276,0
992 RETURN
```

If you have a Commodore 64, change lines 150 and 151 to lines 990 and 991 as shown. To do this, LIST the previous program, cursor up to the beginning of line 150 and type 990, then press RETURN. Then position your cursor at the beginning of line 151, type 991, and press RETURN. Now LIST again, and you'll see the two lines 990–991 at the end of the program. To get rid of line 150, type a 150 all by itself. Entering a blank program line erases that line from memory. Do the same for line 151.

If you have another Commodore computer, change line 150 to line 990 using the same technique (of course, you won't have a line 991 because the 64 has a two-line sound effect and yours only requires one line).

So how does this program work?

The GOSUB command in lines 50, 250, and 450 tells the computer to jump down to line 990 and execute whatever follows (which is your sound effect). When the computer reaches the RETURN command in line 992, it jumps back up to where it left the program, and continues from that point. In this program, the computer plays the sound effect, clears the screen, PRINTs a message and accepts an INPUT, plays the sound effect, then clears the screen again, PRINTs the MERRY CHRISTMAS message, and plays the sound effect one more time before coming to the

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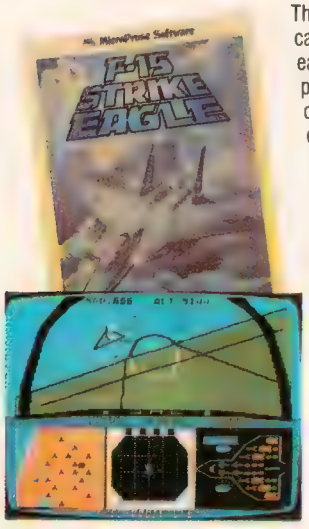

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end of the program. Notice that the GOSUB and RETURN lines come *after* the END command. Try removing line 900 (type a 900 with nothing after it) and running the program again; you'll get an error message. By putting END after the main program, but before the subroutines, we have created a "safe place" for subroutines. The program will execute the subroutine only when you want it to.

You can do fancier sound effects, of course. Any sound effect, long or short—even songs—can be inserted using the techniques we just discussed. You can also use GOSUB-RETURN to repeat other actions as well, such as screen titles, graphics displays, "rewards," or random numbers.

"Press Any Key To Continue"

Did you ever see a BASIC program that instructed you to PRESS ANY KEY TO CONTINUE? This technique freezes your BASIC program until the user presses a key on the keyboard. Let's look at this technique with the same program we've been using. Add these lines:

```
280 PRINT"PRESS ANY KEY"
285 GET K$:IF K$="" THEN 285
```

Type LIST and press RETURN. If you have a 64, your new program should look like this (if you have another computer your program should look pretty much the same, only 990 will be different and there's no 991.

```
50 GOSUB 990
100 PRINT CHR$(147)
200 PRINT"PLEASE TYPE YOUR NAME AND PRESS
    RETURN.":INPUT N$
250 GOSUB 990
280 PRINT"PRESS ANY KEY"
285 GET K$:IF K$="" THEN 285
300 PRINT CHR$(147)
400 PRINT"MERRY CHRISTMAS, "N$
450 GOSUB 990
900 END
990 POKE 54296,15:POKE 54276,33:POKE 5427
    7,9:POKE 54278,0
991 POKE 54273,51:POKE 54272,97:FOR D=1TO
    200:NEXT:POKE 54276,0
992 RETURN
```

Line 280 prints a prompt message telling the user to press any key on the keyboard. Line 285 contains a GET statement which works like this. First it tells the computer to GET K$, which means "check the keyboard and see if a key is being pressed—the next key that is pressed will be called K$." The second part of the line tells the computer, "If *no key* is being pressed, then keep going back to line 285 and checking to see if a key is pressed." The GET statement, together with the IF–THEN test, makes the computer check the keyboard over and over again and "freezes" the program there until a key—any key—is pressed.

"Press A Specific Key To Continue"

Here's another variation which requires the user to press a *specific key.* Change lines 280 and 285 by retyping them as follows (whenever you retype the same program line, it automatically changes):

```
280 PRINT"PRESS THE LETTER C TO CONTINUE"
285 GET K$:IF K$<>"C" THEN 285
```

Now type RUN and press RETURN. This time, instead of freezing the program until *any* key is pressed, the program is frozen until the letter C is pressed. The less than and greater than signs together (<>) tell the computer to keep going back and checking the keyboard as long as any key which is higher or lower than the C is pressed, so when the C is pressed the program drops down to the next line and continues on its merry way. The statement IF K$<>"C" THEN 285 is equivalent to saying, "If K$ is not equal to C, then repeat line 285."

You can require the user to press one of the function keys, too. Let's use function key 1 (f1) to get our response this time. We'll change lines 280 and 285:

```
280 PRINT"PRESS FUNCTION KEY 1 TO CONTINU
    E"
285 GET K$:IF K$<>CHR$(133) THEN 285
```

See how we used the CHR$ number in line 285? In this case, we use the CHR$ number to tell the computer to check to see if the function key is being pressed. This is one of the most important applications of CHR$—to define a key in conjunction with the GET statement.

Reading the function keys is a little more complicated on a Plus/4 and 16, so the two lines above will not work properly.

A Look Ahead At Random Numbers

In an upcoming column we'll explore how random numbers work, but just to take a glimpse ahead, here's a program to try in the meantime:

```
10 X$="{BLK}{WHT}{RED}{CYN}{PUR}{GRN}
   {BLU}{YEL}"
20 X=INT(8*RND(1))+1
30 PRINTMID$(X$,X,1)"{RVS} ";
40 GOTO 20
```

{BLK} means hold down the CTRL key and press the color key marked BLK (the 1 key) at the same time. The other characters in line 10 are obtained with CTRL and one of the other color

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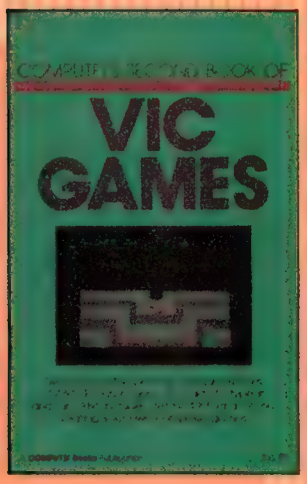

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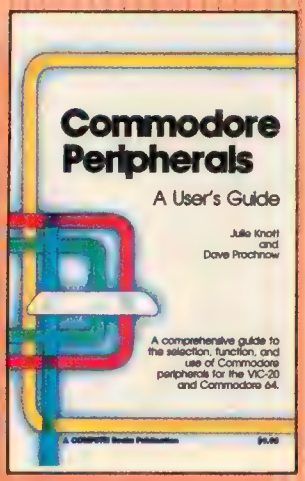

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keys. See the article "How To Type In COMPUTE!'s GAZETTE Programs" for more details. Here's a brief explanation of how this program works:

Line 10 defines X$ as the group of colors inside the quotation marks. Remember, in most cases a string variable is a letter followed by a dollar sign. String variables can be used to define a color as well as letters, graphics symbols, keyboard commands, and numbers not used as values.

Line 20 defines the numeric variable X as a random number. The random number formula is given to the right of the equal sign. INT makes the random number a whole number. The number 8 is the *upper limit* from which the random numbers are chosen, and the number 1 at the end of the line is the *lower limit.*

Line 30 tells the computer to print a character from the middle of the X$ grouping of colors in line 10. The X in parentheses designates how many characters over from the left of X$ the computer should go to choose the color in the group. But since this number is *random,* it could be the first, second, third, fourth, fifth, sixth, seventh, or eighth number. Whichever number it is, that's the color that will be used when the computer goes on in the same line to print a *reverse space* ({RVS} means hold down the CTRL key and press the RVS ON key at the same time). A reverse space is always printed on the screen as a solid block. The semicolon at the end of line 30 makes the reverse spaces (the blocks) print one after the other.

Incidentally, printing reverse spaces is one way to draw solid bars across the screen, or to make solid squares in different colors.

Line 40 tells the computer to go back to line 20 and choose another random number, after which the computer continues with line 30 and prints another solid square, again in a color chosen at random.

The result of all this is a multicolored pattern.

Here's a challenge for you to work on until next month. See if you can write a program, like the one above, that prints a color at random, then a reverse block. Next, using a different string variable, print a cursor movement (up, down, left, or right) at random and go back to pick a new color. Instead of printing characters one after another, the cursor will seem to wander randomly around the screen.

This month, we jumped ahead a little. We'll flesh out many of these programming concepts and techniques in upcoming columns, but until then, experiment with these programs. You might be surprised at what can be accomplished with so little programming. Happy Holidays!

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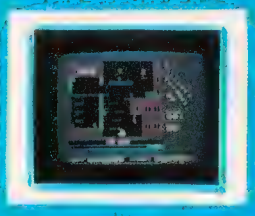

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MACHINE LANGUAGE FOR BEGINNERS

Richard Mansfield, Senior Editor

Customizing

One of the many benefits of writing in machine language is that you can get inside your computer and have it do things your way. As it comes from the factory, things like the LIST command and disk directories are standardized. If you want a different kind of listing or directory, you've got to make your own.

Let's create a disk directory that we can manipulate to suit ourselves. Instead of LOAD "$",8 we can just SYS 830 and see a complete, condensed directory—even on the VIC screen. It won't destroy any program already in RAM. We'll also be able to make any formatting changes we want. Should the filenames be divided into PRG and SEQ lists? Should there be more space between each name? Should the amount of space used on the disk be eliminated from our directory, or highlighted? Whatever format you want, whatever information you need, can be set up the way *you* want it.

Adding Automatic Disk Save To The Simple Assembler

If you have the Simple Assembler, published in the November column, you can type in Program 2 and it will be directly entered into your computer. Then, to save it to disk for future use, type NEW (to get rid of the Assembler) and enter Program 4. Program 4, from an idea by Charles Brannon, can be used to save any machine language program to disk, provided you know the starting and ending addresses. The ML program can then later be loaded with the usual LOAD *"filename"*,8,1.

If you are using the Simple Assembler, you might want to add Program 4 to it as a subroutine. You can use the Simple Assembler variables TA (starting address) and SA (ending address) instead of the INPUT statements in lines 30 and 40 of Program 4. This would make saving your ML routines automatic from within the assembler. It might be convenient to insert Program 4 between lines 250 and 260 of the Simple Assembler. To make SAVEs optional, you could add a SAVE pseudo-op, similar to the END pseudo-op. Another possibility is using save-with-replace if you do a great deal of testing and want the latest version of your routine to always be saved to disk.

You can modify Program 4 to save ML programs to tape by simply changing line 20. Replace the 8 with a 1 and omit the 0: before the filename. As usual, you must avoid putting programs into the tape buffer. A minor quirk of using this method with tape is that when you load an ML program back into memory, you will see FOUND "PROGRAMNAME" twice on the screen. You can use this method for tape saves, but since this month's main program reads a disk directory, you won't be able to use it without a disk drive.

If you have an advanced, label-based assembler, you can type in Program 1 and assemble it. If you have no assembler at all, type in Program 3, the BASIC loader.

When learning machine language, it's often helpful to go through someone else's program step-by-step to see how loops and branches and variables are handled. Let's look at Program 1 and see how machine language is written for an advanced assembler. Program 1 is *source code* (what you write) which the assembler will then translate into *object code* (a runnable program). This source code is written for the LADS assembler in my new book, *The Second Book of Machine Language* (COMPUTE! Books), but would work on most assemblers with few changes. For example, some assemblers use a pseudo-op EQU

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Program 1: Full Source Program For Commodore 64 Easydir

```
10 *= 830
20 ;-----------------------------------------------------------------
30 ;         EQUATES AND DEFINITIONS FOR COMMODORE 64
40 ;-----------------------------------------------------------------
50 FNAMELEN = $B7;     LENGTH OF FILENAME FOR OPEN A FILE
60 FNAMEPTR = $BB;     POINTER TO FILENAME LOCATION IN RAM.
70 FNUM = $B8;         CURRENT FILE NUMBER FOR OPEN, GET & PUT CHARS TO DEVICE
80 FSECOND = $B9;      CURRENT SECONDARY ADDRESS FOR OPEN
90 FDEV = $BA;         DEVICE NUMBER (8 FOR COMMODORE DISK)
110 OUTNUM = $BDCD;    PRINTS OUT A NUMBER--A HOLDS (MSB), X (LSB)
120 OPEN = $E1C1;      OPENS A FILE
130 CHKIN = $FFC6;     OPENS A CHANNEL FOR READ (HAVE FILE# IN X)
140 CHARIN = $FFE4;    PULLS IN ONE BYTE
150 PRINT = $FFD2;     SENDS OUT ONE BYTE
160 CLRCHN = $FFCC;    RESTORES DEFAULT I/O
170 CLOSE = $FFC3;     CLOSE FILE (FILE# IN A)
180 ;-----------------------------------------------------------------
190 ;         INTIALIZATION -- OPEN DIRECTORY. PRINT DISK NAME & ID
200 ;-----------------------------------------------------------------
210 JSR OPEN1
220 JSR CLRCHN:LDX #1:JSR CHKIN; OPEN FILE CHANNEL FOR READING
230 JSR CHARIN:JSR CHARIN; THROW AWAY START ADDR BYTES
240 LDY #29:LOOP JSR CHARIN:JSR PRINT:DEY:BNE LOOP:LDA #13:JSR PRINT
250 JMP CLOSEQUOTE
260 ;-----------------------------------------------------------------
270 ;         MAIN LOOP -- PULL IN ALL FILENAMES & PRINT THEM
280 ;-----------------------------------------------------------------
290 QUOTE JSR PRINTIT
300 OPENQUOTE JSR CHARIN:CMP #13:BEQ CLOSENOW:CMP #34:BNE OPENQUOTE
310 LOOP1 JSR CHARIN:CMP #34:BEQ CLOSEQUOTE
320 JSR PRINT:JMP LOOP1
330 CLOSEQUOTE JSR CHARIN:BEQ ENDTEST:CMP #42:BNE CLOSEQUOTE
340 JSR PRINT:JSR PRINT:JMP CLOSEQUOTE
350 ENDTEST JSR CHARIN:JSR CHARIN:JSR CHARIN:STA SIZE+1:JSR CHARIN:STA SIZE
360 JMP QUOTE
370 CLOSENOW LDA #"F:JSR PRINT:LDA #"R:JSR PRINT:LDA #"E:JSR PRINT
380 LDA #1:JSR CLOSE:JSR CLRCHN; RETURN TO BASIC
390 RTS
400 ;-----------------------------------------------------------------
410 ;         SUBROUTINE -- PRINT OUT THE BLOCKS-USED NUMBER
420 ;-----------------------------------------------------------------
430 PRINTIT LDA #32:JSR PRINT
440 LDA SIZE:LDX SIZE+1:JSR OUTNUM:LDA #45:JSR PRINT:RTS
450 ;-----------------------------------------------------------------
460 ;         SUBROUTINE -- TO OPEN 1,8,0,"$0" FOR READING DIRECTORY
470 ;-----------------------------------------------------------------
480 OPEN1 JSR CLRCHN
490 LDA #1
500 STA FNUM;                  FILE#
510 LDA #8
520 STA FDEV;                  DEVICE NUMBER
530 LDA #0
540 STA FSECOND;               SECONDARY ADDR
550 LDA #2:STA FNAMELEN
560 LDA #<FNAME:STA FNAMEPTR:LDA #>FNAME:STA FNAMEPTR+1
570 JSR OPEN; ROUTINE WITHIN BASIC THAT OPENS UP A NEW FILE
580 RTS
590 ;-----------------------------------------------------------------
600 FNAME .BYTE "$0"
610 SIZE .BYTE 0 0;            SPACE TO HOLD "SIZE" VARIABLE
```

Program 1a: Changes To Create A VIC Version

```
20 ;-----------------------------------------------------------------
30 ;         EQUATES AND DEFINITIONS FOR VIC
40 ;-----------------------------------------------------------------
110 OUTNUM = $DDCD;    PRINTS OUT A (MSB), X (LSB) NUMBER
120 OPEN = $E1BE;      OPENS A FILE  (3 BYTES PAST NORMAL OPEN IN ROM)
```

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instead of the equals sign (=). If you have such an assembler, make the appropriate substitutions.

Line 10 establishes the start address. This is where the assembler will put the ML program. Then there are a series of variable definitions (called *label equates*) where a name is given to various important addresses within the computer. Between lines 50–170, we label all the memory locations which are used to open and close a disk file; read bytes off the disk; and print characters or numbers to the screen. Once we've defined these variables, we can then use just the label name instead of the number throughout the rest of the program. We can say JSR PRINT instead of JSR $FFD2.

In line 210 we jump to a subroutine (situated between lines 480 and 580) which will open a disk file for reading. This particular file is a special one which is named "$0" and holds the directory of the disk. As you can see, we store 1-8-0 into the appropriate locations, store a 2 into the location which holds the length of our filename, and then set up a *pointer* to the filename. A pointer just holds (in two bytes) the address of some other thing in the computer. A pointer could, for example, point to the start of screen RAM. In this case, we want it to point to the $0 in line 600. We don't yet know, however, at which address this $0 will be when the program is finally assembled. So, we give line 600 a label of its own, FNAME, and point to it using #< for the low byte and #> for the high byte. (These #< symbols are special assembler directives to fetch low and high bytes of labels.) After loading and storing (LDA/STA) these bytes into the pointer, we then, in line 570, JSR to the routine in BASIC ROM that opens a disk file. The RTS in 580 ends the OPEN1 subroutine, sending the program back to the main routine.

Opening A Channel

Next (line 220), we clear all channels and, loading X with a 1, we open a channel to file #1. (This is distinct from opening a file. We've already done that. This is closer to the action of INPUT#1.) We are now ready to use CHARIN to pull in bytes from our opened file. However, the first two bytes are pointers the disk drive uses, so we throw them away (line 230).

Now we want to pull in the next 29 characters and print them. This will be our disk name and disk ID number. We set up a loop (line 240) which will get a character, print it to the screen, lower our Y counter by 1 (DEY) and branch back if Y is not yet equal to zero (BNE). Then we LDA #13 and print that, causing a carriage return on screen. And finally, we jump into the main part of the program at a location called CLOSEQUOTE.

The way it's set up, this routine will look for quotation marks and print whatever is between them, but not what's outside of them. The information streaming in to us from the directory file will look something like this:

```
GAMES DISK IC UF 0  18 "BOMBER" PRG 0  24
"CHESS" PRG 0  55 "ADDRESS FILE"
```

We've already printed the disk name and ID and now we are ready to read in all the filenames and file sizes. The size appears first (preceded by a zero and two spaces), then a quote, the filename, another quote, the type of file, and the size of the next file. We only want to print the file size and the name. So, we'll use the quotes to tell us when to turn our printing on or off. And we'll use that zero to tell us when we've found a file size number.

The Main Loop

Let's take it from the top. In line 290 we jump to a subroutine which prints the size number. Then line 300 is a loop which looks for the first quotation mark. If it finds a carriage return (#13), it jumps down to end the whole machine language program. That's because directory files end with a series of #13s. So, when we find a 13, we know we're finished.

Assuming we're not finished, we keep pulling in bytes until we find a quote. That gets us past the BNE at the end of line 300, and we fall down to line 310. This next loop is quite similar to the one in line 300 except it contains a JSR PRINT. Every byte coming in now will be printed on the screen and will allow us to see the filename. We exit this loop when we find another quote symbol (#34).

Now, in line 330, there's another loop which looks for a zero (signifying that a file size number is coming in). That forces us to BEQ and go to the ENDTEST which pulls in the two-byte number. The loop in line 330 also looks for a #42 which is the * symbol. Finding a * would mean that a bad file was on the disk—and we want to be alerted to that. Line 340 will print two ** symbols and then jump back into the loop on line 330 to continue looking for the zero.

Line 350 pulls off the two spaces after the zero, positioning us to get the file size number. We put these two bytes into a variable we've set aside called SIZE (see line 610). SIZE will hold these bytes until we need to print them. Then we start the whole thing over again by jumping back up to the start (line 360 jumps to line 290).

Shutting Things Down

We only get to line 370, the close-down routine, if we came upon a #13 up in line 300. That, you

recall, meant that we'd arrived at the end of the directory file. Anyway, to close down we print the letters FRE (the last thing printed on screen will have been the number of blocks left free on the disk). Then we CLOSE file #1.

We clear the channels, which means that normal I/O conditions are restored: Input comes from the keyboard, output goes to the screen. That last RTS sends us back into BASIC since we got to this ML program with a SYS. SYS acts just like a JSR except that it goes from BASIC to ML and then an unmatched RTS will send you back to BASIC.

How did I know enough about the format of directory files to be able to construct this ML program? Often the easiest thing is to first construct a BASIC program to see how things work. I set up a simple BASIC sketch:

```
10 OPEN 1,8,0,"$0"
20 GET #1, A$:PRINT A$;:GOTO 20
```

and then just watched what came in on the screen, counted spaces, and figured that the quotes, the zeros, and the carriage returns (#13) would be my triggers. They would be the IF/THEN signals that something different was happening. They could be tested for in loops and force exits from those loops.

See program listings on page 194.

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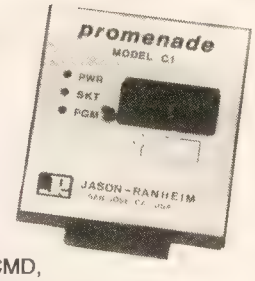

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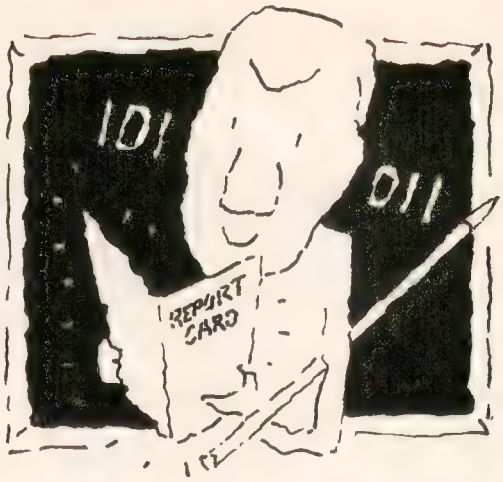

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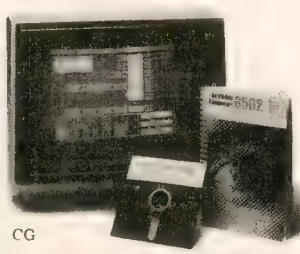

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Anthony James Daly

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You may not have thought about it before, but the keyboard on your computer is just another peripheral. The chip that controls the computer is not directly connected to the keyboard; it has to talk to the keyboard through an interface chip, much like it talks to a disk drive or printer.

Keystrokes don't enter the computer directly. They are funneled into the *keyboard buffer*, an area of memory which can be directly accessed by the chip which controls the computer.

Sixty times a second your VIC or 64 interrupts whatever it is doing for some housekeeping. The jiffy clock (which registers every sixtieth of a second) ticks once, the screen is refreshed, and the keyboard wiring is checked for a signal that a key was pressed. But before the character is printed on the screen, its ASCII value is put into the keyboard buffer at memory locations 631–640. At the same time, the value in location 198, which keeps track of how many characters are in the buffer, is increased by one, unless it has reached its maximum of ten. When you're typing, the letters aren't printed directly from the keyboard to the screen; they make a short stop in memory.

In immediate mode (when a program is not running), the characters are pulled out of the keyboard buffer immediately and put on the screen.

But when a program is running, the characters are saved up until the program either ends or tries to INPUT or GET. You can see how this works if you enter FORJ=1TO5000:NEXT, a simple delay loop. After pressing RETURN, hit a key twenty times. When the loop ends, you should see ten (not twenty) of the letters on the screen. That's because the keyboard buffer comprises only ten bytes. Once it is full, nothing more is added until the buffer is accessed with an INPUT or GET.

Think of the keystrokes as raindrops falling through a funnel (the interface chip) into a tiny bucket (the keyboard buffer) which can hold only ten drops at a time. When the bucket is full, no more raindrops will fit until the bucket is emptied.

With a few POKEs, we can control the keyboard buffer and its contents.

Emptying The Buffer

Manipulating the buffer at 631–640 and the byte at 198 (number of characters currently in the buffer) can solve some common programming problems.

For example, you're playing a game and it asks PLAY AGAIN (Y/N)? and you type Y. Nothing seems to happen for whatever reason; maybe the computer is setting up variables. So you press Y again. A second later you see INSTRUCTIONS (Y/N)? flash briefly on the screen, followed by the first of 20 pages of instructions. You didn't want the instructions, but you got them anyway.

The problem is that the second time you typed Y, it was stored in the keyboard buffer. When your computer got to the instructions prompt, it went to GET a character and found a Y right there.

A variation on this can happen in data entry (say, a checkbook balancing program). Perhaps you mean to enter a check for $36 but you miss the top row of keys, hitting E and Y by mistake. You see ERASE EVERYTHING for a moment, followed by ARE YOU SURE (Y/N)? The Y in the buffer answers the question for you and three hours of work are destroyed.

The solution is simple. Since location 198 holds the number of characters in the buffer, POKE 198,0 tells the computer nothing is there at the moment. Use this POKE before INPUT or GET statements to eliminate extra characters in the buffer.

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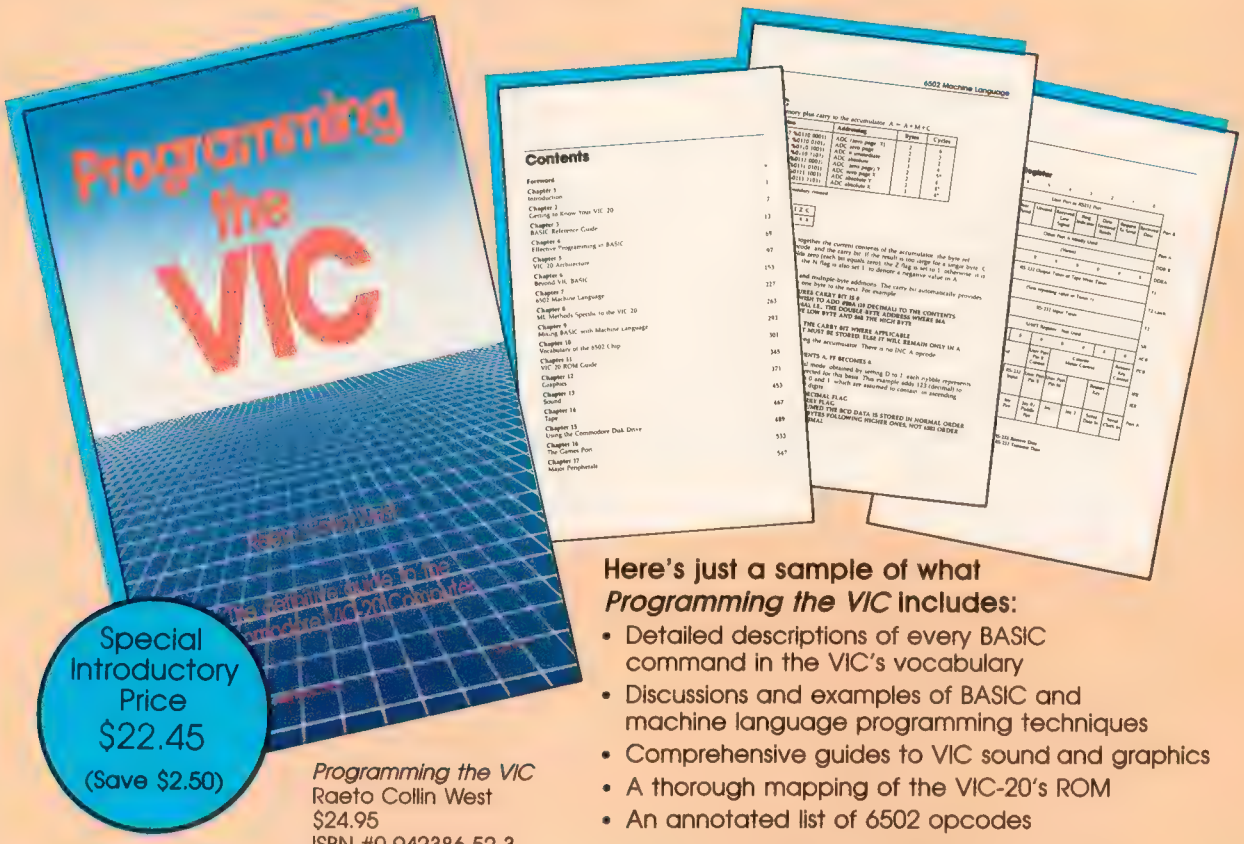

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Press Any Key To Continue

Since location 198 holds the number of keys pressed, we can use it for a user-defined delay.

A title screen or page of instructions often includes a line like PRESS ANY KEY TO CONTINUE, since some people read faster than others. The usual way of checking for a key press is to use a GET statement. To save a little memory, use WAIT instead. To be safe, clear the keyboard buffer first. POKE 198,0: WAIT 198,1 is a substitute for 50 GET A$:IF A$ = "" THEN 50, uses less memory, and doesn't need a whole line of its own.

The same technique can be useful in immediate mode. For example, you might want to use all 25 lines (23 on a VIC) to print variable values or PEEKs. Use a FOR-NEXT loop to print the values and then WAIT 198,1. Without the wait command, the screen fills up, scrolls to print READY, scrolls again, and you lose the first few lines.

Filling The Buffer

POKEing numbers into the keyboard buffer (and location 198) can fool the computer into thinking certain keys have been pressed.

Perhaps you're writing a game with nine levels of difficulty. When it starts, the player is asked to choose a level. Before the INPUT statement, POKE 631,53: POKE 632,157: POKE 198,2 to set up a default value of level 5. When you reach the question about levels, the computer finds a 2 in 198 (which makes it think two keys have been pressed), gets a character "5" (ASCII value 53) and prints it. Next, it finds an ASCII 157 (cursor left). The user just presses RETURN for difficulty level 5 (because the 5 is already on the screen). Any other value can be entered by pressing the appropriate key.

The buffer holds up to ten characters, which provides a lot of flexibility for setting default values in programs which use INPUT (for obvious reasons, you can't do this with GET). Just remember to use ASCII values, starting at 631, and POKE the total number of characters into 198. You can even change the character color or turn reverse on.

The dynamic keyboard technique (more on this in an upcoming issue) uses a variation on this idea. You fill up the keyboard buffer with carriage returns (ASCII 13), print BASIC commands or program lines on the screen, position the cursor, and end the program. The computer sees END and goes into immediate mode. Because there are 13's in the buffer, the commands on the screen execute. You might, for example, add DATA statements by printing an open line number, the word DATA, and some information you want to build into the program. Underneath the new DATA line, print RUN. Position the cursor, POKE 13's into 631 and 632, and a 2 into 198. When the program ends, the DATA statement is added to the program and the program runs.

You could also list-proof a game which uses joysticks but not the keyboard. At the beginning of the program, POKE the numbers 78, 69, 87, and 13 into locations 631–634. POKE a 4 into 198. If the game player presses the STOP key, the letters N, E, W appear and the program is gone. Or POKE the values for R, SHIFT-U (the abbreviation for RUN), and carriage return. Any time you press STOP, the program will stop for a moment and then run.

More Keyboard Memory Areas

Near the keyboard buffer are some other memory locations related to the keyboard. Location 646 is the current character color, which can be POKEd in the same way you change border or background color.

Location 649 determines the size of the keyboard buffer. For the minimum buffer (one character long), POKE 649,1. This can be useful when you don't want the buffer to fill up with extra characters. To get rid of the buffer, POKE 649,0 and try typing something. Nothing happens. By setting the buffer length to zero, the computer has nowhere to temporarily store the characters. It's as if we pulled the bucket away from the funnel. You can regain control by hitting RUN/STOP–RESTORE. You should not put a value higher than ten in this byte because some important vectors can be overwritten.

The repeat flag is stored in 650. POKE 650,128 to make all keys repeat. POKE a 0 to go back to normal (space bar and cursor keys repeat). A 64 in 650 disables all repeating.

Thus, if you're writing a rapid-fire action game, you might want to make all the keys repeat. You would put a 128 into 650 and leave the buffer size at 10. But for a game where movement has to be precise, you could lower the buffer size to 1 or 2 and eliminate all repeating keys.

In an educational program for children, you might want to get rid of repeating keys with a POKE 650,64. For a spreadsheet, you'd leave the default values, so the cursor keys would repeat and allow quick movement from cell to cell. For word processing, though, you might as well allow all keys to repeat. Controlling the behavior of the keyboard buffer and related memory locations can help you create programs which are both efficient and convenient to use.

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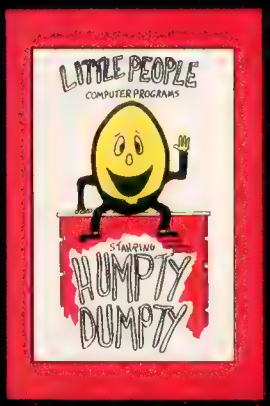

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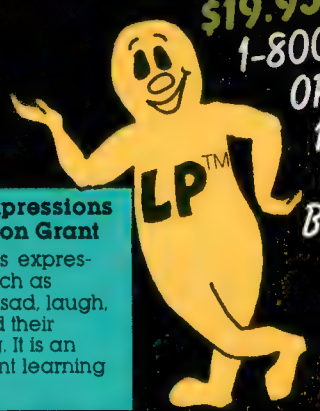

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GAZETTE Telecommunications Software, Part 2: The C/G Bulletin Board System

Robert Sims

This month we continue our presentation of the color/graphics telecommunications package. "C/G Term," published last month, allows two people to use a modem to connect their computers directly over the phone lines, and to communicate using the full color and keyboard graphics capabilities of the VIC or 64.

The "Color/Graphics Bulletin Board System" (C/G BBS) makes it possible for many people to trade information and programs without being in direct one-to-one contact.

The BBS is written entirely in machine language (ML), but no knowledge of ML is required to use it. Because the listing is so long, we're publishing the first half of the code this month. The remainder will appear next month. A 64 with one or two disk drives, a 1650 Automodem, and a printer are required.

An electronic bulletin board functions in much the same way as its conventional namesake: Messages can be put up about most anything, whether it's free kittens, meeting announcements, or a lost sweater.

With "C/G BBS," anyone with a basic knowledge of the Commodore 64 can put up an electronic bulletin board almost as easily as hanging an ordinary bulletin board. Instead of a cork board and some wall space, you need a computer system, a modem, and a phone line. Other than that, it's similar to a bulletin board in any school or office hallway.

But there are some important differences in the ways these two kinds of message boards are used. You can read an electronic board without leaving home. You can leave or receive private messages. And electronic boards can contain long documents or program listings that won't fit on a conventional bulletin board.

There are several kinds of electronic bulletin boards, with various capacities. Large information services like CompuServe, The Source, and Delphi contain bulletin boards that hold a thousand messages and allow many callers to use the board simultaneously. And they're on-line 24 hours a day.

At the other extreme are small boards which have a capacity of 50 messages or less, allow only one person to access the system at one time, and may be on-line only a few hours a day.

The C/G BBS is a small system, but it has some features not usually found on small bulletin boards. It is simple to operate, it automates as many of the technical aspects of telecommunications as possible, and callers are presented with menus or simple prompts rather than a long list of commands.

Also, the BBS may contain from 120 to 1000 public messages (depending on length) and as many private messages. Messages are stored in "endless" files. When the records are full, the program calculates how much room it needs for a new message and adjusts its tables accordingly. The oldest messages are automatically erased as new ones come in, so the board operator doesn't have to worry about running out of storage space.

Calling The BBS

To call a C/G BBS, you need a VIC or 64, a modem, and a copy of C/G Term (published last month). Because the C/G BBS and C/G Term communicate using unique codes, other terminal programs will not work with this bulletin board.

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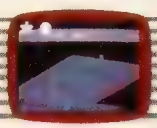

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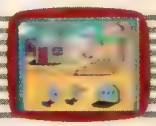

Spell Now

Attach your modem and set it for originate. Turn on your computer and load and run C/G Term (published in last month's GAZETTE).

Then place the phone call to your local C/G BBS. When you hear the carrier signal (a high-pitched tone), unplug the cord from the telephone handset and plug it into the modem if you have a VICmodem. (Automodem users should move the T/D switch from T to D.)

Then press the space bar on your VIC or 64 and you'll see the welcome message from the BBS. You'll then be asked for an ID number. If this is your first time on the board, you won't yet have an ID number, so press RETURN to tell the BBS that you are a new user.

You'll see a brief message, then you'll be asked to supply your name, address, and phone number so the sysop (system operator) can set up your account. Although you might want to use a pseudonym while on the bulletin board, you must provide the sysop with your real name, address, and phone number. Once that information is entered, you'll receive the main menu containing nine options:

```
MAIN MENU

1) Read messages
2) Leave a message
3) Pick up EMAIL
4) Send EMAIL
5) Download library
6) Upload area
7) Chat with the sysop
8) New password or handle
9) Log off
>
```

Messages are public; anyone can leave them for anyone else to read. Email ("Electronic Mail"), as its name implies, is a private message from one user to one other. You can only read EMAIL addressed to you.

As a new user, you can only read messages, chat with the sysop (system operator), or log off.

After the sysop has contacted you and given you an ID number and password, you'll have full access to the bulletin board.

Read A Message

To read the public messages, type a 1 when you see the prompt (>) at the end of the main menu. You will then be given the choice to read the full text of messages or to scan the headers—who sent the message, who it's addressed to, and the subject. When you type in your choice, you'll be told which messages the board contains, and asked for the number of the first message you want to read. As a new user, you probably want to begin with the first message, which is displayed after you enter a 1 and press RETURN.

At the end of each message, on the bottom line of your screen you'll see the prompt:

```
RETURN r m (?=help)
```

To read the next message, press RETURN; to go to the read messages menu, press r; to get back to the main menu, press m. And if you forget what each response means, type a question mark.

You can read the entire message file by pressing RETURN after each message is displayed. To go back and read an earlier message, press r for the read messages menu and enter the message number you want.

Sending Messages

To leave a message on the board (after you've been signed up by the sysop), select option 2. Your screen will clear and you'll be prompted to name the person you're leaving the message for. Type in the person's handle (a name less than 25 characters) and RETURN. The program automatically inserts your name and ID number into the message, so everyone knows you sent it. Next, the subject prompt will appear. Respond with a line of less than 32 characters and RETURN.

The screen will clear again, and you're ready to type in the message. You can type freely, using the cursor keys or RETURN to move the cursor around. Use the color and reverse keys just as you do when your computer is in immediate mode with no program running. And your terminal program includes a routine that won't let your message scroll up the screen if you accidentally move the cursor onto the bottom line of the screen.

When you're finished composing your message, press f2. You'll see the prompt "one moment please..." on the bottom line of the screen, then the cursor will disappear, and the computer will seem to pause while it collects the message from the screen, translates it into a form that can be transmitted, and sends it to the bulletin board where the message is stored in the message file.

The time required to transmit and store a message depends on the length of the message. A message of 1000 characters with several colors can take as long as 30–40 seconds.

When this automatic process is complete, you'll see this prompt on the bottom line of your screen:

```
Message # XXX has been sent
```

Then the screen will clear and the main menu will be displayed.

Electronic Mail

The procedure for reading and sending private messages is essentially the same.

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If you choose option 3, the BBS will search its electronic mail (email) file tables for messages addressed to your user ID number. If the files contain messages for you, the BBS will send the first email message, with a prompt in the bottom line of the screen asking whether you want to erase the message. After you read the email and respond by typing y or n (yes or no), the BBS will display your next email message, and so on, until the last message is sent. The BBS then clears the screen and returns you to the main menu.

Each time you pick up your mail, the BBS sends all your messages, whether you have read them before or not. So, to avoid cluttering your mailbox with old letters, it's a good idea to erase each one after you read it.

To send email to another bulletin board member, you follow the same steps as in sending regular messages. But when the "To" prompt appears, you must enter a user ID number instead of a name. The program ignores any non-numeric input.

The Download Library

If you select the download option, you will be given a menu of the available files, with a brief description of each. To download a file, simply type the number of your selection at the > prompt. After a pause, you will be asked to enter a filename so your terminal program can store the file on disk. (Be sure the filename is not a duplicate of some file already on the disk.)

After you supply the filename, the download procedure is automatic. You will see a series of numbers scrolling up the screen as the file comes in. When the transfer is complete, you'll be returned to the main menu. (For a more detailed discussion of the transfer procedure, see last month's article.) The BBS transfers files at an approximate rate of 1K bytes in two minutes. So a file containing about 5000 bytes (20 disk blocks) will transfer in 10 minutes.

Any file you download from the C/G BBS is ready to use when it's stored on disk. Some BBS software sends files which must be converted before they are usable, but your terminal program performs this conversion before it stores the file. If you're anxious to try out the program or text file you just downloaded, select main menu option 9. You'll see the 9 displayed after the > prompt, and the cursor will move to the next line. You are now disconnected from the BBS. Disconnect the modem from the phone line, clear the terminal program from the computer, and you're ready to load and run the downloaded program.

Uploading To The BBS

The C/G BBS allows callers to upload files as well. So long as there is room on the email disk, a caller can submit a file for inclusion in the download library. The upload procedure is similar to downloading, except that you supply the filename of an existing file on your disk. The terminal program collects the file from your disk and transmits it to the BBS.

As part of regular BBS maintenance, the sysop will look at the submitted file and decide whether to add it to the download menu. To avoid duplicate filenames, the BBS stores the transmitted file using a name in the sequence UP01, UP02, UP03, and so on. When the file is uploaded, the BBS sends a record of the transfer to the printer, so the sysop will know who sent the file and what the caller wants to name the file.

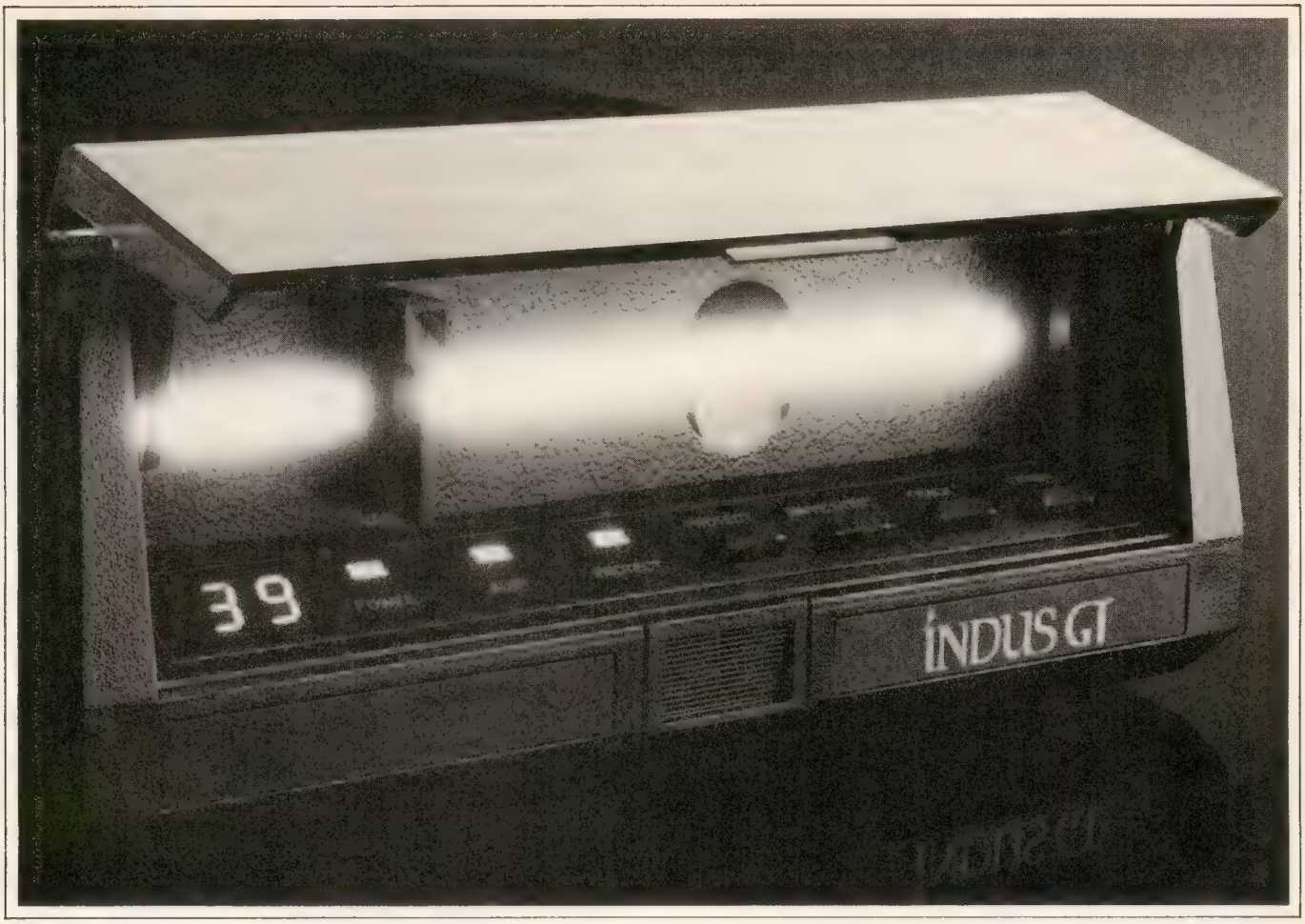
All upload operations should involve two files: the file itself and a documentation file which explains how to use the main file. A documentation file can be as simple as a BASIC listing that consists of REM statements, or it can be a document produced with *SpeedScript* or another word processor.

To help the sysop and other callers identify your uploaded files, you should use file extensions which describe the type of file. A BASIC program might have the extension .BAS, a documentation file of REMark statements might have an extension .REM or .DOC, a *SpeedScript* file can bear the extension .SPD, and so on. For example, a machine language sort program could be uploaded as SORT.ML and its accompanying documentation file might be SORT.SPD or SORT.REM.

The next option allows you to change your name or password. When the sysop opens your account, your first name will be put in the file. If you prefer to use a pseudonym or nickname, use this option. Also use it to change your password regularly. If another caller discovers your password, he or she can go on-line and leave messages in your name. If the BBS has a fee, you'll be paying for their time.

Talking To The Operator

If you find some of the BBS procedures confusing, or you just want to say hello, you can leave messages and email for the sysop (for email, use ID # 1000). For an immediate conversation, you can use option 7, chat with the sysop. When you select this chat feature, the BBS tells the sysop you want to talk. After you page the sysop, continue using the board. If the sysop is available, he or she will make contact at a point when you are receiving the main menu. So don't page the



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sysop and then proceed to download a file that takes 20 minutes. Return to the main menu frequently so the sysop can make the connection.

The sysop activates the chat feature by pressing the f1 key on the BBS keyboard at any time after he or she is paged. The board contains an interrupt routine that goes to the chat mode instead of the main menu.

In chat mode, the caller and the sysop type normally, just as when two copies of C/G Term are communicating. The sysop can change his or her border color by pressing f3, change the background color with f4, and clear the screen with f6. When the two of you are through talking, the sysop returns the caller to the main menu by pressing f2.

Maintenance

Just as with a regular cork bulletin board, someone must update an electronic board, removing outdated messages and generally maintaining order.

The sysop can perform maintenance on the C/G BBS in one of two ways: Use the maintenance sequence, which occurs when the board is first run, or force the board to maintenance mode by pressing f7 while the board is on-line. This causes the program to go to the maintenance routines when the current caller logs off. The maintenance call can be canceled by pressing f8.

Normally, when you log off, the BBS updates its tables to include new messages or changes in your name or password, and adds your time on-line to the cumulative time stored in your user file. (Cumulative time is stored as total minutes, in binary coded decimal format.) In addition, your user ID number and time on-line are sent to the printer so the sysop will have a running record of traffic on the BBS. This printed record helps the sysop keep up with who is using the board and when the upload area is getting full, so he or she can perform timely maintenance.

Maintenance includes defining the system, updating the download library and processing uploaded files, typing in new user information, and updating the message files.

At the beginning of maintenance, the sysop sees this menu:

Does your system have:

1) one drive, # 0, device 8
2) two drives, # 0, devices 8 and 9
3) two drives, # 0 and 1, device 8

If the BBS is being run with one 1541 drive, option 1 is selected. With one drive, only the public message files are in use. The board does not have email, download, or upload capability.

With two drives, the board is fully operational. The system operates with the message disk in drive 0 (or device 8) and the email disk in drive 1 (or device 9).

After the system is defined, there is a pause of a few seconds while the tables containing message locations are loaded into memory from a file on the message disk.

An Automatic Menu Builder

Then the download menu is created automatically from files which the sysop stores on the email disk while the board is off-line. The download library can contain up to nine files. Each filename to be included in the download library must begin with the letter D. The BBS prints each filename in turn and asks the sysop to type in a description of up to 50 characters. The menu is then compiled and stored in memory.

If the email disk contains no filenames beginning with D, the program will display an empty menu, and a caller must type a 0 to return to the main menu. The email storage file takes up 405 blocks, leaving 259 available for the download library and uploaded files.

Changing User Information

After the download menu, the sysop is given the option of updating the user information files and message files.

If the user files are chosen, the sysop will see a menu which allows him or her to change the user's name, password, cumulative time on-line, or status. The first three options are used mainly in setting up a new account. After the initial entry, the user can maintain his or her own name and password changes, and cumulative time is computed automatically.

However, option four, status, is accessible only to the sysop. Through this option, the sysop can enter a code that automatically refuses to let the user log onto the board. Such a feature is a regrettable necessity.

Updating Messages

By choosing to update messages, the sysop causes the board to talk to itself. The program gets its input from the keyboard instead of from the modem, so the sysop can read messages, erase messages, and leave messages for other users.

The sysop reads messages just as other callers do, except that he or she has the added ability to erase regular messages by typing a k (kill message) at the RETURN r m (?=help) prompt. This feature is accessible only from the BBS keyboard; the erase routine ignores modem input while the BBS is on-line.

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To leave a message or email, the sysop must use C/G Term to create the message. Load and run C/G Term and press CTRL-C then f8 to enter message mode and create a message. The BBS message disk is then inserted into the drive, and the message is saved to disk by pressing f5.

Then, when the sysop is performing system maintenance and selects the send message option, the program asks for the filename of the message. After the name is entered, the program automatically adds the message to the system files.

To exit from the message maintenance mode, the sysop selects 9) Log off, and the program returns to the regular maintenance sequence.

When maintenance is complete, the sysop responds with an n to the prompt:

Update system files (y or n)

and the BBS is ready to take the next call.

Creating The BBS

The complete BBS will consist of three disks containing seven files. First, the bulletin board program and the auxiliary programs (see below) must be typed in and stored on a disk. Then a message disk is created, containing the message file, the user information file, and a file which holds the tables necessary to locate and display each message. The third disk will contain the email messages, and the download and upload libraries.

To create the message file, load the following program (CREATEMSG) and insert the formatted message disk in device 8. Then run the program, which creates a relative file of 401 records, each containing 254 bytes:

```
10 REM CREATE RELATIVE MESSAGE FILE
20 OPEN15,8,15:OPEN1,8,2,"MSGFILE1,L,"+CH
   R$(254)
30 PRINT#15,"P"+CHR$(98)+CHR$(145)+CHR$(1
   )+CHR$(1)
40 PRINT#1,"@END"
50 CLOSE1:CLOSE15
60 END
```

Remove the message disk and insert the formatted email disk. Then make the following change in the program:

In line 20, for "MSGFILE1,L," substitute "EMAIL,L,"

Then run the program, which now creates the email relative file. Next, remove the email disk and insert the message disk again. Make these changes to the program:

```
10 REM CREATE RELATIVE USER STATUS FILE
20 OPEN15,8,15:OPEN1,8,2,"USTAT,L,"+CHR$(
   86)
30 PRINT#15,"P"+CHR$(98)+CHR$(244)+CHR$(1
   )+CHR$(1)
```

Now run the modified program. This will create the user information file, which consists of 500 relative records of 86 bytes each. (One record holds two user files.)

Finally, type NEW, then load the short machine language program (Program 1, "Tables Setup"):

LOAD "TABLES.OBJ",8

Insert the message disk and run this program to create and store to disk a file containing the initial message file pointers and other default settings which the BBS will need for its first run.

These files need be created only once, before the board is run for the first time. After that, the BBS program handles the file contents automatically.

After the files are created on the message and email disks, you should select the files you want to include in the download library and store them onto the email disk.

Going On-Line

When you are ready for the BBS debut, connect the Automodem to the 64 and the phone line, and set the switches for full duplex, answer, and data. Then load the bulletin board program (Program 2):

LOAD "BBS",8

Insert the message disks and email disks, and run the program. After you go through the initial maintenance sequence, the BBS will wait for the first caller. You can now call yourself a sysop.

But being a sysop involves more than running the program and walking away.

Operating a bulletin board requires a large commitment of time and resources. Also, there's a certain amount of paperwork, and several decisions to be made before you go on-line.

First, the phone line and computer system will be unavailable for other use while the BBS is running. If you have only one phone and one computer, you'll have to operate the board part-time. You may want to consider establishing regular operating hours, so people will know when to call. And be sure to notify your friends that you will be unavailable to talk on the phone during those hours.

If you plan to have a separate phone line and computer just for your board, you can run the BBS 24 hours a day. But your 64 and disk drive can overheat under such heavy use, so round-the-clock operation is not recommended. Since the disk space available for file transfers is limited, you'll need to take the board off-line at least once a day, anyway.

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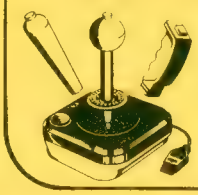

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If you run the BBS for several hours before you turn off the computer, then you should provide ventilation, especially for the disk drive. I've found that filter fans work well for this purpose. A filter fan is a small fan which draws air in its bottom, through a filter, and pushes the air out the top. The filter traps dust, smoke, and other harmful airborne debris. There are several desktop models available for $20–$50.

Although the BBS can run unattended, you should monitor the system regularly. Callers will want to chat, the upload area will fill up, and you need to check the printout for new users.

A new user's name, address, and phone number are printed out so you can verify the information and add the caller's new ID number and password to the user information file.

Each regular caller generates at least two lines on the printer. The last three digits of the ID number are printed when the caller logs on. On log-off, the ID number is printed again, with the number of minutes the caller was on-line. If a file is uploaded, the ID number is printed, followed by the filename the caller gave the file and the name under which it's stored on the email disk (UP01, UP02, and so on).

To keep your upload and download functions running smoothly, you should process uploaded files every day. While the BBS is waiting for a call, move the T/D switch to T for telephone. Remove the system disks and press RUN/STOP–RESTORE. Insert the email disk in device 8 or drive 0. Then look on the day's printout for the upload filenames UP01 and so on.

Check the filename the caller gave the file to see which are document files. Then load each document file and read it to see what the main file contains. If you decide to include the file in the download library, you must rename it (see the manual that came with your drive for details on renaming files). Your new filename should begin with the letter D.

Remember that you can only have nine files in the download library, so you will have to scratch files to make room for new ones.

Since you can have up to 999 bulletin board members, you may want to set up a record-keeping system to keep track of who's got what ID number, which files they upload, and cumulative time on-line.

If you decide to run a free board, then this basic paperwork will be sufficient.

Bulletin boards traditionally are free and open to all, but several factors are changing that situation.

As more people become active in telecommunications, boards are more crowded. Some sysops are setting time limits for each caller.

Also, there have been cases recently in which the police have confiscated sysops' computers when illegal material such as stolen credit card numbers and pirated software have been found on the boards. Consequently, many sysops are being more selective about who they let on their boards.

And finally, many sysops can't afford to absorb the cost of an extra phone line and extra computer system to operate a 24-hour board. These sysops charge a small fee to cover those costs.

Each of these factors means more work for the sysop. You should check the messages regularly and cancel any that contain illegal material. The C/G BBS doesn't allow anonymous messages, so you can identify the caller who left the unacceptable message and notify them by email why their message was canceled.

If you charge a fee, you'll need a way to keep track of billing and income (be sure to keep complete records for tax purposes).

Typing In The Machine Language

First type in, save, and run MLX, found elsewhere in this issue. When prompted for the starting address, respond with 2049. The ending address is 17828. Be sure to save this program to which you will append Part 2 next month. C/G BBS is over 14K, so, for the sake of magazine space, we're publishing the first half of the code this month and the second half next month. Instructions on resuming with Part 2 will appear next month.

If you'd rather not type in the program, send $3, a stamped, self-addressed mailer, and a blank disk, and I'll send you the entire ready-to-run BBS object code, the auxiliary programs, and the bulletin board source code (in PAL/LADS format).

Robert Sims
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See program listings on page 177.

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Auto Line

Don Gibson

This handy utility, which is compatible with Automatic Proofreader, automatically numbers a BASIC program as it is being written. It can also quickly delete a range of lines. For the VIC and 64.

Some computers, including Commodore's new Plus/4 and 16, have an auto-number command built into BASIC. You can turn it on whenever you're writing a program; after you enter a program line, the computer figures out the next line number and prints it. You choose what the increment will be: one, three, five, ten, or whatever.

It turns out to be fairly simple to add such a feature to the VIC or 64. "Auto Line," a short machine language wedge, automatically numbers lines, and also serves as a quick-delete utility.

Entering Auto Line

After typing in the program listing, save it to tape or disk before running. The last statement to be executed is a NEW, so the BASIC loader program erases itself after completing the POKEs. If you use Automatic Proofreader, make sure you disable it with RUN/STOP–RESTORE before you save Auto Line.

The 64 version (Program 1) is put into memory starting at location 49152, a safe area for machine language (ML) programs, but the BASIC loader program can move the ML elsewhere if you need the block of memory beginning at 49152 for another purpose. One possibility is the cassette buffer (starting at 828). To relocate the 64 version of Auto Line, change the variable SA (starting address) in line 10 to a safe part of memory.

The VIC version gives you two choices of where the program will go, the cassette buffer or a protected spot at the top of BASIC memory. When you first run it, you will be asked where you want to put Auto Line. If you store programs on tape, avoid using the cassette buffer for Auto Line. Instead, tape users should choose the option of putting the program at the top of memory, which will subtract 104 bytes from available BASIC RAM.

If you're using 8K or more memory expansion with your VIC, you'll have to change line 10 accordingly. PRINT PEEK(56),PEEK(55) will tell you the normal values for top of memory, which you can then plug into line 10. Or, if you're using expansion memory, you can delete line 10 altogether (the disadvantage to removing the line is that if you run the loader program more than once, the top of memory will move down 104 bytes each time).

The program defaults to incrementing lines by ten; line 10 is followed by 20, then 30, and so on. You can change this, however. Line 110 of the VIC version (line 60 of the 64 version) sets variable IN (increment) to ten. You can change it to any number from 1 to 255. If you want to change increments in the middle of the program, you can POKE the number you want into SA+46 (SA is the starting address, the SYS number). For example, if you choose to put the program in the cassette buffer, starting at 828, to change to increments of five, POKE 828+46,5 will work (don't use POKE SA+46—the variable SA loses its value after the program is NEWed). Or if you're using the 64 version, starting at 49152, POKE49152+46,20 would change the increment to twenty.

Line Numbering And Line Deleting

After saving Auto Line, type RUN. If you typed it in correctly, you should see a message telling you the SYS number. Write down the number (in case you want to disable Auto Line and then turn it on again). Type SYS and the number on the screen, and the first line number will appear on the screen. The program thinks you're starting at zero, so the first number will be the same as the increment value. It should be ten (unless you changed the increment variable IN as described above).

You can now type a BASIC line, press RETURN, and the next line number appears. Enter

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the next line and the program continues, automatically printing the appropriate line numbers.

What if you don't want the program to start with line 10? Press the DELete key three times, until the 10 is erased (or just type a SHIFT-RETURN to move to a blank line), then type the line number you want followed by a BASIC line. The program keeps track of the last line number used, and adjusts itself accordingly. You also have full control of the usual editing functions. If you discover you made a mistake on a line, do what you would usually do—cursor up to it, correct it, and press RETURN.

Press the RUN/STOP key to disable Auto Line. The SYS will turn it back on.

An interesting by-product of Auto Line is that it can be used to delete large sections of a program. To erase a BASIC line, you simply enter the line number with nothing after it. So, with Auto Line working, pressing RETURN again and again will erase the lines which appear on the screen. Of course, if the increment is set to ten, you won't erase lines which were later inserted. If you want to delete a section of a program, it might be best to set the increment to 1, with a POKE to the starting address plus 46, as explained above. If you're planning to delete a lot of lines, you'll have to press RETURN many times. POKEing a 128 into location 650 causes all keys (including RETURN) to repeat, and saves wear and tear on your fingers when you're doing a massive delete.

Compatible With Proofreader

Auto Line is also compatible with Automatic Proofreader, so you can use both to type in programs from the GAZETTE (if they're numbered in regular increments). Since Proofreader resides in the cassette buffer, you must not put Auto Line there (and if you're using tape, you must load Auto Line before loading Proofreader). Put Auto Line at 49152 on a 64, at the top of memory on a VIC.

To use the two programs as a combination, change line 70 (64 version) or line 120 (VIC version). Delete the NEW statement at the very end of the line and replace it with
LOAD"AUTOPROOF",8 (disk) or
LOAD"AUTOPROOF",1 (tape). When you load a program from within another program, it loads and automatically runs.

Tape users can also follow the directions on the Proofreader page for creating a PROOFREADER.T file, placed right after Auto Line, and add OPEN1:CLOSE1 to Auto Line, in place of the NEW statement in line 70 (64 version) or line 120 (VIC version).

You can use both Auto Line and Automatic Proofreader to work on a partial program which has been saved to tape, but you have to load them in the correct order. First, if you have not done so, create a PROOFREADER.T file (as described in the Proofreader article). Load and run Auto Line, making sure you put it high in memory, with a starting address SA of 49152 on a 64, or top of BASIC in a VIC. Don't enter the enabling SYS yet. Next, load your partial program from tape. Finally, use the OPEN1:CLOSE1 technique to get the PROOFREADER.T file into the cassette buffer. Enter SYS886 to start up Proofreader, and SYS to the starting address of Auto Line.

How It Works

Auto Line is a short program (104 bytes of machine language) which derives its power from Kernal routines and specific operating system pointers. It contains two wedges and a pointer-switch routine.

When a program is running, the computer is in *program mode.* Otherwise, it is in *immediate mode.* In immediate mode there are two things you can do: Type a BASIC line without a line number, for immediate execution (PRINT FRE(0), for example) or enter a line number followed by a BASIC line.

The workhorse routine of BASIC is called MAIN. When the computer is in immediate mode, MAIN calls a subroutine which checks for a keypress. When it finds one, it prints the character on the screen. It also handles things like cursor controls and insertions/deletions. Pressing RETURN sends MAIN to an evaluation routine, which looks for a number at the beginning of the line. If there's a number, the line is tokenized and added to the BASIC program in memory.

Since BASIC line numbers are stored in a Low Byte/High Byte format, the ASCII numbers on the screen have to be translated to two bytes. So if you begin a line with the number 600, the operating system has to change the three characters "6" and "0" and "0" to a low byte 88, high byte 2 (since 88+2*256 equals 600). The results of the translation are temporarily stored in zero page locations 20–21 ($14–15).

A pointer at 770–771 ($0302–0303) tells BASIC where the MAIN routine is located.

The pointer-switch routine at the beginning of Auto Line changes 770–771 to point to the first wedge. The wedge program checks 20–21 for the last line number and then adds ten (or whatever increment you have chosen) to calculate the next line number. The new integer value (low byte/high byte) is then sent through

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the integer-to-floating-point conversion routine. The resulting floating point (FP) number is then sent through the BASIC FP-to-ASCII routine, to get the characters which will be printed to the screen. An 88 and 2, for example, would be converted first to a five byte FP number, then to the three characters which make up "600".

In a machine language version of the Dynamic Keyboard technique, the ASCII characters are then stored in the keyboard buffer, and the wedge jumps to the regular MAIN routine. The operating system handles the characters in the buffer as if they had been typed from the keyboard and prints them on the screen. When you enter a line and press RETURN, the line is added to BASIC memory, and the wedge takes over again, printing the next line number based on what's in bytes 20 and 21.

The second wedge intercepts the IRQ interrupt. It checks to see if the STOP key has been pressed. If so, the IRQ and MAIN vectors are restored to their normal values, which has the effect of turning Auto Line off. If you SYS to the starting address of Auto Line, the pointer-switch routine sets the vectors to point to the two wedges, turning Auto Line back on.

One quirk of Auto Line is that if it's running and you LIST a program, the listing will be followed by the usual READY prompt and a number one less than the increment. If you're numbering by ten, the number nine will follow the READY prompt.

This is because the two bytes which hold the line number (20 and 21) are sometimes used for other purposes. LIST uses 20–21 to keep track of the highest line to list and the highest possible two-byte number is 65535 ($FFFF). If you type a plain LIST, a 255 goes into both bytes. After the program is listed, Auto Line adds the increment to 20 and 21, and the number wraps around to one less than the increment.

If you use a top limit when you list, like LIST –100, the number (100 in this case) is converted to a two-byte integer and stored in 20–21. Auto Line then adds the increment. So if you're numbering by tens and LIST –100, the program is listed, the screen says READY, and the number 110 appears.

If you find this feature annoying, press the RUN/STOP key to disable Auto Line before LISTing your program.

The highest line number allowed in BASIC is 63999; anything higher will cause an ILLEGAL QUANTITY ERROR. Thus, if you use Auto Line to write a program numbered in the 63000 range, it's possible you'll reach the limit, in which case the bytes at 20–21 are scrambled. It's perhaps best to avoid line numbers in this range, or enter them while Auto Line is turned off.

See program listings on page 195.

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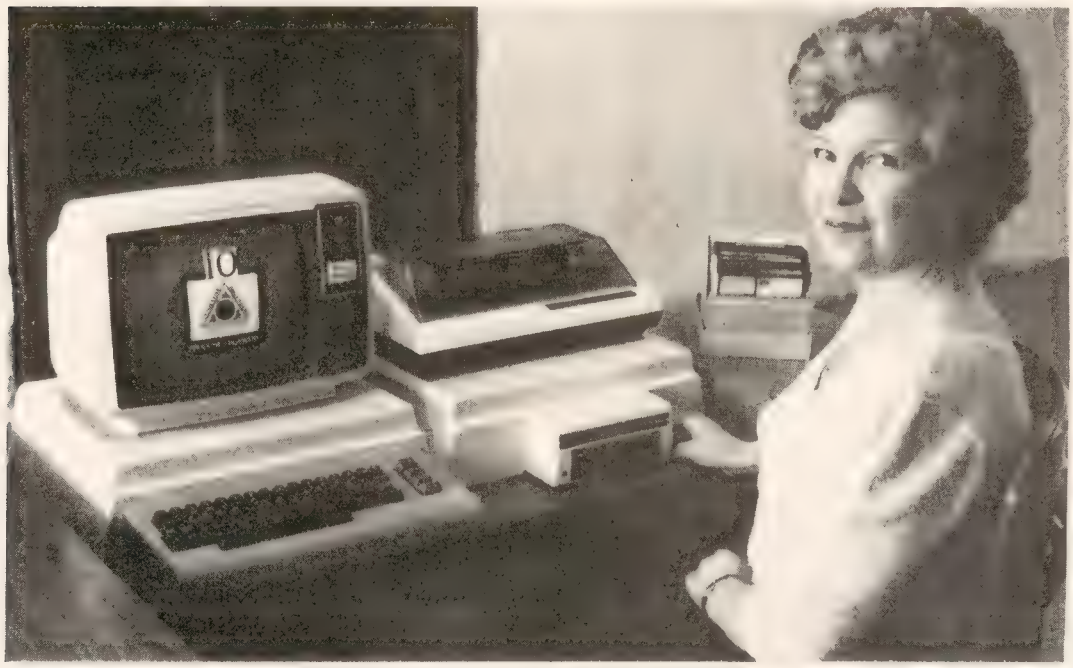

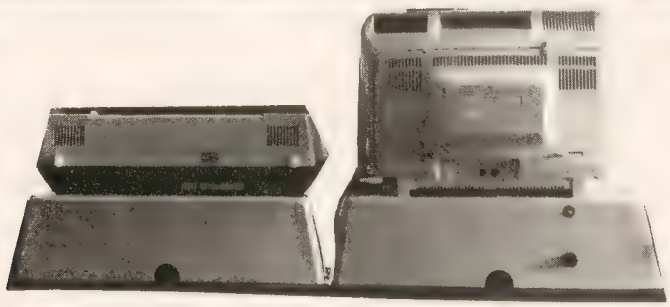

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HORIZONS: 64

Charles Brannon
Program Editor

Redefined characters, sprites, medium- and high-resolution, page-flipping, fine scrolling, and 16 colors give the 64 some of the best graphics capabilities found on any low-cost computer. But what are graphics good for? Games, at least, make good use of graphics. Business programs can draw detailed colored graphs that extract meaning out of a seemingly patternless mass of numbers. Yet graphics for their own sake—art, if you will—are a valid application for computers.

Computer drawing programs can bring out latent talent, even from those who protest "I just can't draw." One reason is that such programs take away much of the tedium normally associated with creating graphic art. If you can't draw a straight line, or if your circles look more like mutant eggs, you can get the computer to do it for you, with mathematical precision. Those who have been frustrated with pencil and paper will revel in the artistic freedom and power offered by a good drawing program.

Graphics Peripherals

There are several ways to enter graphics into a computer. The most straightforward is a camera that takes pictures and converts them into computer pixels. No skill or technique is necessary; just point the camera and shoot. Unfortunately, camera digitization is usually too expensive for use with a home computer. Even so, it remains a tantalizing alternative. The technology is available; we can only wait for prices to come down.

The keyboard can be used to give commands for circles, lines, and boxes, with the cursor keys used to move around the graphics screen. This can be tediously slow and indirect.

The next step up is a joystick. Instead of pressing keys labeled with directions, you just push the joystick in the desired direction. Avid game players have developed specialized joystick dexterity, which is instantly applicable to a drawing program. The major drawback of a joystick is that it can only move in four cardinal and four diagonal directions. Freehand drawing with a joystick tends to produce awkward, sharp-angled drawings.

A trackball, made of a billiard ball mounted on two wheels, gives you smoother control. When you move the ball, the wheels spin, and the direction of spin is similar to joystick directions. If you spin the ball forward, an "up" value is returned, the same as if you pressed the joystick forward. Unlike a joystick, a trackball can return a series of directions that better approximate the spin of the ball, so you effectively get more than just eight directions. Any program that works with a joystick will also work with a trackball. A trackball can be imprecise, though, since it tends to keep spinning after you've started it rolling. It can also be difficult to draw straight lines with a trackball, but it's much easier to approximate curves than with a joystick.

Mousing Around

A mouse controller is not a rodent trainer; it's a device similar to an upside-down trackball. As you move the mouse on the desktop, it reports its relative position. The screen cursor mimics the mouse movements. After some practice, moving the cursor with the mouse becomes second nature. The Macintosh and Lisa computers brought the mouse to prominence, and mouse controllers are the latest rage for the Apple II and IBM PC. Some people feel that mouse controllers are a gimmick, and could be replaced by inexpensive

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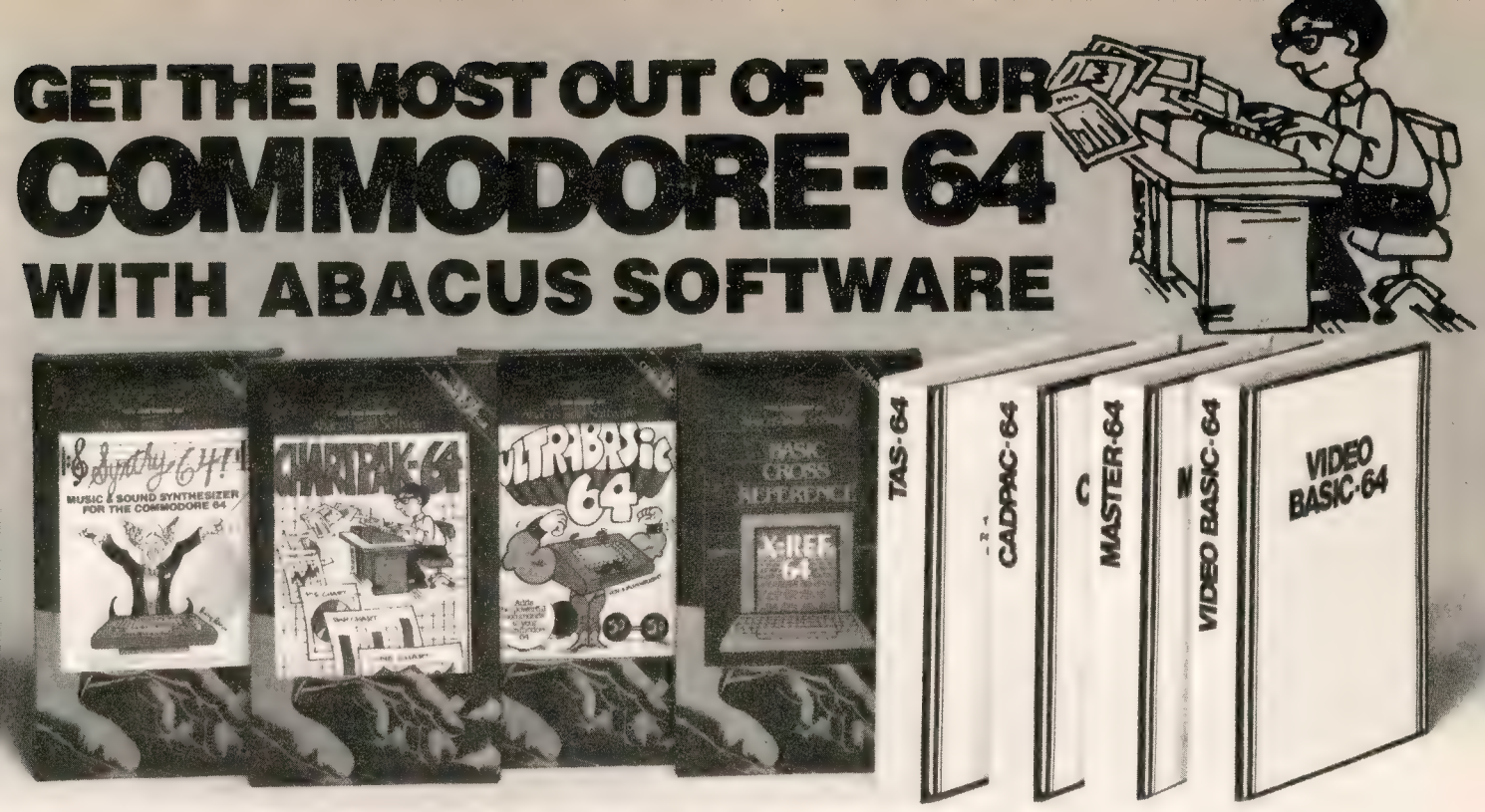

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joysticks or trackballs.

However, what business executive would want to be seen using a joystick with *Lotus 1-2-3*? A mouse is an improvement over joysticks, giving precise, natural control. It's a little strange to draw with one, though. We're used to pencil and paper, and drawing with a mouse is like using a pencil point mounted underneath a cigarette package. Since mouses must roll about, they consume some desk space, and some surfaces are not conducive to easy rolling.

The promise of being able to draw directly on the TV screen with a light pen is enticing. At the tip of a light pen is a phototransistor, which turns on when stimulated by light. A TV screen does not emit continuous light, although it seems so to our slow human perception. The electron gun behind the TV tube sweeps from left to right, top to bottom, redrawing the screen 60 times a second. When the beam reaches the position of the light pen, the light-sensitive pen turns on, commanding the VIC chip to store the current position of the raster beam. A light pen, then, merely reports its current horizontal and vertical position. You need software to drive a light pen and make it seem that you are drawing directly on the screen.

In practice, light pens have some drawbacks. Foremost is that we're used to drawing on a horizontal surface, whereas a TV screen, of course, is vertical. Holding your arm and hand in the required position can be quickly tiring, often within seconds. Light pens are also imprecise in that the tip of the light pen covers several pixels, making it challenging to exactly position the light pen. Since it's almost impossible to hold the pen rock-steady, the position jitters about, so it's difficult to draw straight or smooth lines. Many light pen programs take several samples of the light pen's position, then compute an average. This alleviates the jitter problem, but slows down on-screen response.

Getting In Touch

Of all the input devices, the touch tablet is the easiest to use. A touch tablet is an inexpensive version of a digital graphics tablet. You draw with a stylus on a rectangular pad, which tells the computer where the pen is on the pad. The most expensive digital pads offer high resolution, using magnetic fields to sense the position of the stylus. Touch tablets sense pressure, and are relatively inexpensive. Since they detect pressure, you can draw with your finger or a blunt stylus. You have to learn to look at the screen while you're drawing, trusting that the tablet will relay your movements. It's easy to trace drawings with a touch tablet, so even if you're not an artist, you can look like one. Tablets offer many of the advantages of mouse or light pen controllers, and are best for drawing, although the mouse or light pen are easier to use for pointing and making on-screen menu selections.

There are numerous drawing programs available for the 64. To give you an idea of the state of the art (pun intended), we'll take a brief look at some of the most popular drawing programs for the 64: *KoalaPad* from Koala Technologies, the *Tech Sketch Light Pen* with *Micro Illustrator*, *Peripheral Vision* from Futurehouse, and *Doodle!* from City Software.

Some drawing programs include the graphics controller. The *KoalaPad* includes a touch tablet, and both *Tech Sketch* and *Peripheral Vision* come with light pens. The *Tech Sketch* light pen has a switch on the tip, but the *Peripheral Vision* lightpen requires you to trigger it from the keyboard. *Doodle!* works with a standard Atari-type joystick, though City Software recommends you use a trackball. The hardware has to be considered when comparing the prices of these products. Both Futurehouse and Koala Technology justify the expense of the hardware by offering a wide range of programs that make good use of the light pen or touch tablet.

Both the *Tech Sketch* light pen and the *KoalaPad* come with very similar versions of *Micro Illustrator*, which Koala Technologies has dubbed *KoalaPainter*. *Micro Illustrator*, which is licensed by Island Graphics, is a popular base for graphics programs on many computers. *KoalaPainter* does offer some improvements over the version of *Micro Illustrator* used by the Tech Sketch light pen, but you may want to make your decision in terms of the controller (touch tablet or light pen) and the price. *Micro Illustrator* is one of the easiest graphics programs to learn and use, and versions exist for several computers. Both *Peripheral Vision* and *Doodle!* have features unavailable in *Micro Illustrator*, but are somewhat harder to learn and use. *Micro Illustrator* and *KoalaPainter* both use a full screen menu with pictures and descriptions. You just point to the command you want, then go back to the graphics page. You draw a circle by pressing the button once, then moving the controller. As you move the controller, the circle gets larger or smaller, depending which direction you move. When the circle is the size you like, press the button again to stamp it down. *KoalaPainter* lets you move the circle after you've defined it.

Peripheral Vision draws circles in three steps. First you lay down an X-shaped mark that represents the center of the circle, then you place another mark to represent the outer edge of the circle. Finally, you select the circle by pointing to a small menu at the bottom of the screen. You don't actually see the circle until it's permanently

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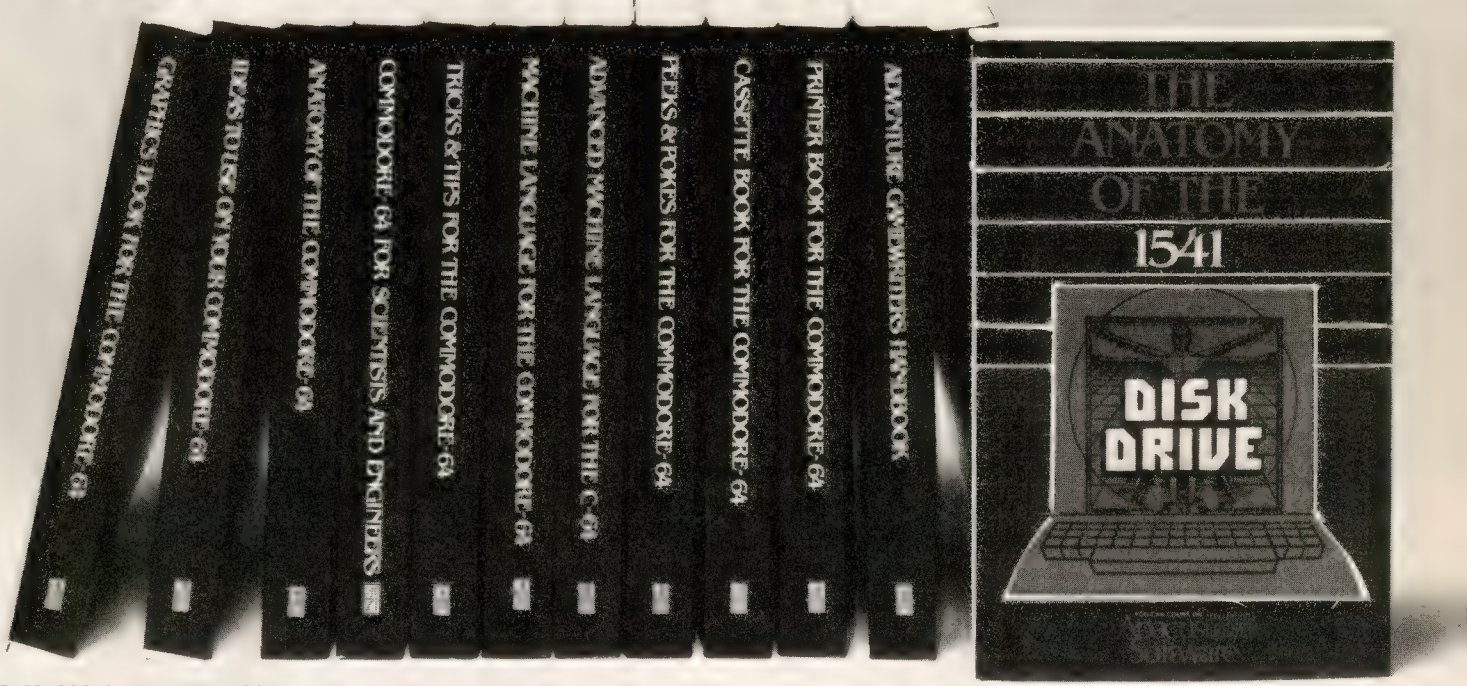
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drawn, whereas both *Micro Illustrator* and *KoalaPainter* let you preview the circle as you are expanding the size.

Doodle! also does not let you preview the circle, but it's still very easy to draw one. You select the circle mode with a function key. If you can't remember which function key to use, there are some brief help screens available for each command. In the circle mode, the cursor changes to two intersecting arrows. You move the joystick left and right to move the horizontal arrows toward or away from the center. This represents the horizontal axis of the circle or oval. Moving up or down adjusts the vertical arrows. You then press the joystick button, and the joystick can be used to position the cursor. The fire button alternates between moving the cursor and positioning the arrows. You then press the back-arrow key to draw the circle.

The various ways of drawing circles offer a good idea of the philosophy of these programs. While less direct than the others, *Doodle!* makes it easy to draw not just circles, but ovals of any proportion.

Features common to all these programs are freehand drawing, lines, connected lines, rectangles, circles, mirror image, fill-in, multiple colors, and zoom. With *KoalaPainter* or *Micro Illustrator*, you fill in an area by selecting Fill. The cursor changes to the word Fill. You move the cursor inside the figure, then press the button to fill the area. A figure must be completely enclosed, or else the Fill can escape through tiny holes in the outline, sometimes washing over and erasing your entire picture (like trying to fill a leaky swimming pool and ending up flooding your backyard). *Peripheral Vision* is unique here. It quickly traces the outline, and will not perform the Fill unless the outline is complete.

KoalaPainter, Doodle!, and *Peripheral Vision* each let you move and copy areas of the screen, although *Micro Illustrator* lacks this feature. *Peripheral Vision*'s copy command only copies the outlines of shapes, not what's inside them, but it's fun to watch the cursor continually trace the shape. With *KoalaPainter,* you draw a box around the area you want to move, then press the button. You then move the box, press the button, and the area is copied. *Doodle!* also boxes in the area, but you can actually re-size the shape before you put it down. You can grab a section of the screen, and reduce or enlarge it before you set it down. You can also reverse and flip horizontally and vertically. A unique feature of *Doodle!* produces an effect much like op-art. All the lines within the box are doubled.

In summary, I've found *Micro Illustrator* and *KoalaPainter* to be the easiest to learn and use, with the choice made on the basis of price and the peripheral used (light pen or touch tablet). *Peripheral Vision* can be purchased with its own light pen, and has some innovative touches. *Doodle!* needs no extra hardware. It's not as easy to learn, but has more features and variations than any of the other drawing programs covered here. If you can, go to your local computer or software store and try them all out. See which one is best for your drawing needs.

KoalaPad *with* KoalaPainter
Koala Technologies, Inc.
3100 Patrick Henry Drive
Santa Clara, CA 95052-8100
$99.95 disk; $110 cartridge

Peripheral Vision
Futurehouse, Inc.
P.O. Box 3470
Chapel Hill, NC 27514
$39.95; $59.95 with light pen

Doodle!
City Software
725 West Wisconsin Avenue
Milwaukee, WI 53233
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ADA TRAINING COURSE

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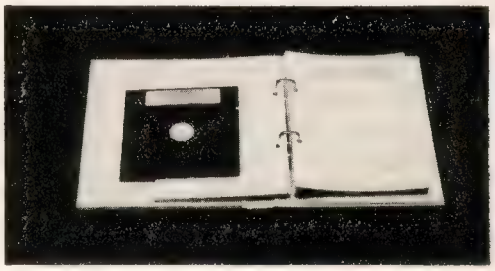

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User Group Update

Changes

A software exchange user group, American Program Exchange 64 (A.P.E. 64), has been started in California. For more information, write A.P.E., James Wyatt, Executor, 3820 Brave Ave., Bakersfield, CA 93309.

The Commodore 64 West users club of West Los Angeles and Santa Monica has a new address. The club can be contacted at P.O. Box 406, Santa Monica, CA 90406-0406.

The Suburban 64 Users Group, listed in the August Gazette with a Massachusetts address, has moved to Florida. It can now be reached care of Ken Partridge, 1360 SW 82nd Terrace, Apt. #625, Plantation, FL 33324. The phone number is (305)474-6923.

The Fox Valley PET Users Group, based in Illinois, has a new name and address. Correspondence to the Fox Valley Commodore Users Group should be sent to Herb Gross, 833 Prospect, Elgin, IL 60120; the phone number is (312)695-1316.

The New Mexico Commodore User's Group can be reached at P.O. Box 37127, Albuquerque, NM 87176. The new president is Susan Palmer.

The updated address for the Irving Commodore User Group is P.O. Box 165034, Irving, TX 75016. No phone calls, please.

The Grey Locker User Group has a new name and contact persons. Inquiries should be directed to Littleton C-64 Users Group, c/o either Jamie Silva, 8 Richmond St., Littleton, NH 03561, or Tom Walker, Mt. Eustis Rd., Littleton, NH 03561.

The Merrick (NY) Commodore Club is no longer accepting mail or telephone calls.

The Commodore Users Group of Rochester (CUGOR) has a new mailing address: CUGOR, P.O. Box 26514, Rochester, NY 14626.

When writing to a user group for information, please remember to include a self-addressed, stamped envelope. Send additions, deletions, and corrections for this list to:

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P.O. Box 5406
Greensboro, NC 27403
attn: Commodore User Groups

New Listings

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P.O. Box 1163
Arcadia, CA 91006
(818)904-0607

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Greg Edwards
091 W. 9th, #203
Clovis, CA 93612

San Bernardino Commodore 64 Club
Carl Gardenas
1804 N. Dundee
Highland, CA 92346
(714)864-4498

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Wayne Weichel
301 Veronica Drive
Paso Robles, CA 93446
(805)238-6294

COLORADO

Colorado Springs Computer Society (CSCS)
Michael V. Brazonis
QTRS 5938-A
Colorado Springs, CO 80913
(303)576-4219

Western Slope Commodore User Group
c/o On Screen Computer Store
535 Main Street
Grand Junction, CO 81501
(303)242-0083

DELAWARE

First State Commodore Club
P.O. Box 1313
Dover, DE 19903

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Lake Sumter Commodore Users Group (L.S.C.U.G.)
Roger Coffey
P.O. Box 416
Leesburg, FL 32748
(904)343-2688

The Central Florida Commodore User's Club, Inc.
Thurman Lawson
P.O. Box 15949
Orlando, FL 32858
(305)886-0390

GEORGIA

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P.O. Box 842
Morroe, GA 30260

Covington C-64 User Group
Keith L. Brown
P.O. Box 642
Oxford, GA 30267

IDAHO

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Gary Edwards
506 Lunceford Lane
Coeur d' Alene, ID 83814
(208)765-3803

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Alton, IL 62002
(618)462-7136

Gateway Computer Club
Richard Fisher
P.O. Box 207
Belleville, IL 62222

Chess Players' Commodore User Group
John R. Menke
723 Barton Street
Mt. Vernon, IL 62864

Spud Users Group
P.O. Box 471
River Forest, IL 60305
BBS: (312)456-0395 or
(312)344-SPUD

INDIANA

Fulton County Commodore User's Group
Brian Eshelman
R.R. 1, Box 22
Rochester, IN 46975
(219)223-2672
or
Jim Tyler
1703 Madison Ave.
Rochester, IN 46975
(219)223-4430

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Olney, MD 20832
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Ridgewood, NJ 07450
(201)447-4422

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(315)652-7491

OHIO

Commodore Computer Club of Toledo (CCCT)
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Toledo, OH 43623

PENNSYLVANIA

Butler Commodore 64 User Group
P.O. Box 2408
Butler, PA 16001

SOUTH CAROLINA

Rock Hill Commodore User Group (RHCUG)
Robbie Smarzik
565 Scaleybark Circle
Rock Hill, SC 29730
(803)366-7918

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Commodore Computer Club
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(615)649-5962

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Jim O'Rear (512)854-4156
1717 Graham
Corpus Christi, TX 78418

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2904 N. Alleghaney
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Janesville, WI 53547

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Dick Lendl
1504 Shelley Court
North Fond du Lac, WI 54935

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Canadian Commodore 64 Users Group
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Marlborough Commodore Users Group
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Raymond Dragseth
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Balboa Ancon,
Republic of Panama
Phone: 60-4758
BBS: 82-3336

Commodore Hardware Users Group—Riyadh (CHUG-R)
Don W. Fry, Jr.
USREP/JECOR-CENPRO
Box 259
APO NY 09038

Note: This user group is in Saudi Arabia. The above address should be used by people with APO privileges, or by U.S. user groups. Persons using international or Saudi Arabian mail should use the following address:

CHUG-R
Don W. Fry, Jr.
USREP/JECOR-CENPRO B-259
P.O. Box 5927
Riyadh, Saudi Arabia 11432

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EXECUTIVE QUALITY PROFESSIONAL BUSINESS SOFTWARE

The Cadillac of Business Programs for Commodore 64 Computers

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Easy to use. Just plug into your Commodore 64 computer and you're ready to transmit and receive messages. Easier to use than dialing your telephone just push one key on your computer! Includes exclusive easy to use program for up and down loading to printer and disk drives. List $129.00 **SALE $79.00.**

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makes other graphics tablet obsolete. This new TECH SCETCH LEARNING PAD allows you to draw on your T.V. or Monitor and then you can print whatever you draw on the screen on your printers. FANTASTIC!!! List $79.95 **SALE $49.00** Coupon $39.95

NEW VOICE SYNTHESIZER $59.00

For Com-64 or VIC-20 computers. Just plug it in and your can program words and sentences, adjust volume and pitch, make talking adventure games, sound action games and customized talkies!! FOR ONLY $19.95 you can add TEXT TO SPEECH, just type a word and hear your computer talk—ADD SOUND TO "ZORK", SCOTT ADAMS AND AARDVARK ADVENTURE GAMES!! (Disk or tape)

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Just plug in our 32K RAM MEMORY EXPANDER and you get as much usable programming power as the Commodore 64 computer!! Master control switches on cover. Gold Edge connectors, five year warranty (FREE $29.95 CARTRIDGE GAME)

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Increases VIC-20 programming power 4 times. Expands total memory to 41K (41,000 bytes). Memory block switches are on outside cover! CARDCO Includes FREE $29.95 game!!

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Excellent quality SANYO, easy to read, 80 columns x 24 lines. Green Phosphorous screen with anti-glare, metal cabinet! Saves your T.V. PLUS $9.95 for connecting cable. Com-64 or VIC 20

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Your choice of green or amber screen monitor top quality, SANYO 80 columns x 24 lines, easy to read, anti glare, faster scanning! PLUS $9.95 for connecting cable Com 64 or VIC-20

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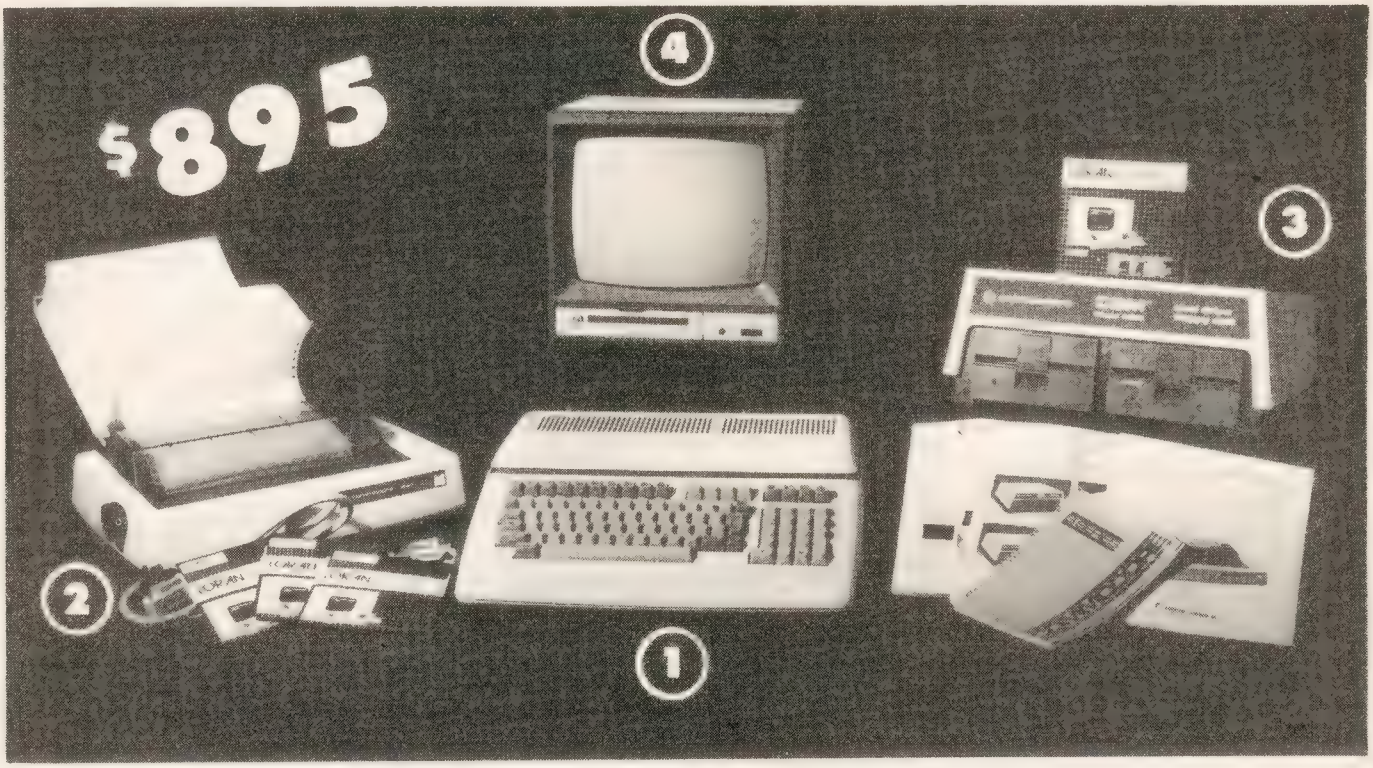

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(replace the 4023 with the following at these sale prices)

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Comstar Hi-Speed 160 CPS 15½" Serial Business Printer	$779.00	**$499.00**
Telecommunications Deluxe Modem Package	$199.00	**$139.00**

15 DAY FREE TRIAL. We give you 15 days to try out this SUPER SYSTEM PACKAGE!! If it doesn't meet your expectations, just send it back to us prepaid and we will refund your purchase price!!
90 DAY IMMEDIATE REPLACEMENT WARRANTY. If any of the SUPER SYSTEM PACKAGE equipment or programs fail due to faulty workmanship or material we will replace it IMMEDIATELY at no charge!!

Add $50.00 for shipping and handling!!
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(Lowest price in USA)

14" Color Computer Monitor

16 COLORS

- Built in speaker and audio
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- Beautiful Color Contrast
- High Resolution
- Sharp Clear Text
- 40 Columns x 24 lines
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15 Day Free Trial - 90 Day Immediate Replacement Warranty

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80 Columns x 24 lines, Hi-Resolution-crisp clear easy to read text with anti glare screen! A Must for word processing.

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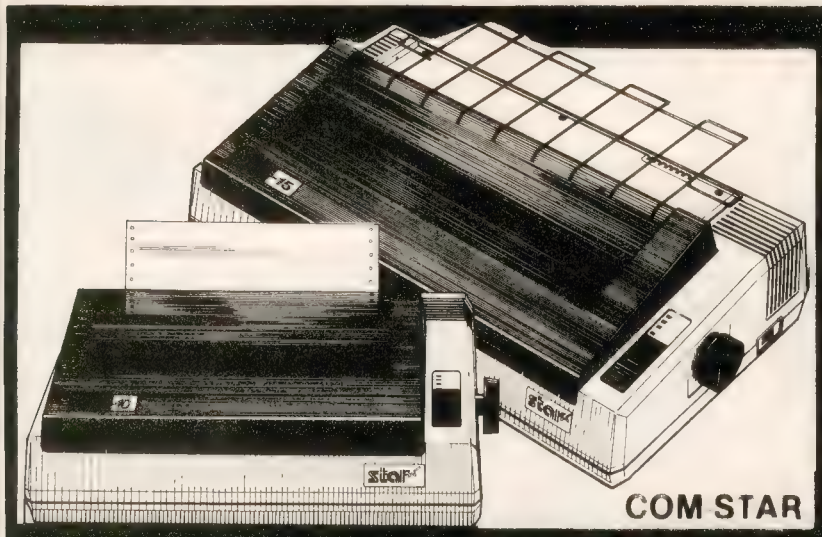

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Tractor
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only $ 169**

- Lowest Priced, Best Quality, Tractor-Friction Printers in the U.S.A.
- Fast 80-120-160 Characters Per Second • 40, 46, 66, 80, 96, 132 Characters Per Line Spacing
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** DELUXE COMSTAR T/F 80 CPS Printer — $169.00

This COMSTAR T/F (Tractor Friction) PRINTER is exceptionally versatile. It prints 8½" x 11" standard size single sheet stationary or continuous feed computer paper. Bi-directional, impact dot matrix, 80 CPS, 224 characters. (Centronics Parellel Interface).

Premium Quality 120-140 CPS 10" COM-STAR PLUS+ Printer $249.00

The COM-STAR PLUS+ gives you all the features of the COMSTAR T/F PRINTER plus a 10" carriage, 120-140 CPS, 9 x 9 dot matrix with double strike capability for 18 x 18 dot matrix (near letter quality), high resolution bit image (120 x 144 dot matrix), underlining, back spacing, left and right margin settings, true lower decenders with super and subscripts, prints standard, italic, block graphics and special characters. It gives you print quality and features found on printers costing twice as much!! (Centronics Parallel Interface) (Better than Epson FX80). List $499.00 **SALE $249.00**

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Has all the features of the 10" COM-STAR PLUS+ PRINTER plus 15" carriage and more powerful electronics components to handle large ledger business forms! (Better than Epson FX 100). List $599

SALE $349.00

Superior Quality 10" COM-STAR+ H.S HIGH SPEED 160-180 CPS Business Printer $369.00

This **Super High Speed Com-Star+ Business Printer** has all the features of the 10" COM STAR+ PRINTER with HIGH SPEED BUSINESS PRINTING 160-180 CPS, 100% duty cycle, 8K Buffer, diverse character fonts, special symbols and true decenders, vertical and horizontal tabs. **A RED HOT BUSINESS PRINTER** at an unbelievable low price (Serial or Centronics Parallel Interface) List $699.00 **Sale $369.00.**

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This **Super High Speed COM-STAR+ 15½" Business Printer** has all the features of the 10" COM-STAR BUSINESS PRINTER witha 15½" Carriage and more powerful electronic components to handle larger ledger business forms! Exclusive bottom feed. (Serial Centronics Parallel Interface) List $799.00 **Sale $469.00**

Olympia

Executive Letter Quality DAISY WHEEL PRINTER $379.00

This is the worlds finest daisy wheel printer **Fantastic Letter Quality,** up to 20 CPS bidirectional, will handle 14.4" forms width! Has a 256 character print buffer, special print enhancements, built in tractor-feed (Centronics Parallel and RS232C Interface) List $699 **SALE $379.**

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For VIC-20 and COM-64 — $49.00 For Apple computers — $79.00 Atari 850 Interface — $79.00 For ALL IBM Computers — $89.00

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COM-STAR PLUS+ Print Example: ABCDEFGHIJKLMNOPQRSTUVWXYZ ABCDEFGHIJKLMNOPQRSTUVWXYZ 1234567890

COMMODORE-64 or VIC-20

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NEW NEW

MAKE YOUR COMPUTER TALK

VOTRAX BASED HARDWARE

SALE ONLY $59.00

You can program any words or sentences • Adjust volume and pitch • Make adventure games that talk • Real sound action games • Make customized talkies • (Demo disk or tape included) • Requires Speaker

You can add **TEXT TO SPEECH SOFTWARE** that allows you to simply type what you want to hear!! Also allows you to add sound and voice to **SCOTT ADAMS AARDVARK** and **"ZORK" ADVENTURE GAMES** List $29.95 Sale $19.95 (Disk or Tape).

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80 COLUMN BOARD

SALE

FOR ONLY $99.00

Now you can program 80 columns on the screen at one time! Converts your Commodore 64 to 80 columns when you plug in the PROTECTO 80 Expansion Board. List $199.00. **Sale $99.00.**

Includes 4 Slot Expander and can be used with most existing software!!!

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Now you get this **Fantastic Tech Sketch Computer Learning Pad Program** with a **Professional Light Pen** Free! (39.95 value) plus the **Micro Illustrated Graphics Pad Program** that allows you to draw on your T.V. or monitor screen (better than Gibsons $99 light pen). Whatever you can draw on the screen you can print on your printer (a Tech Sketch Exclusive.)

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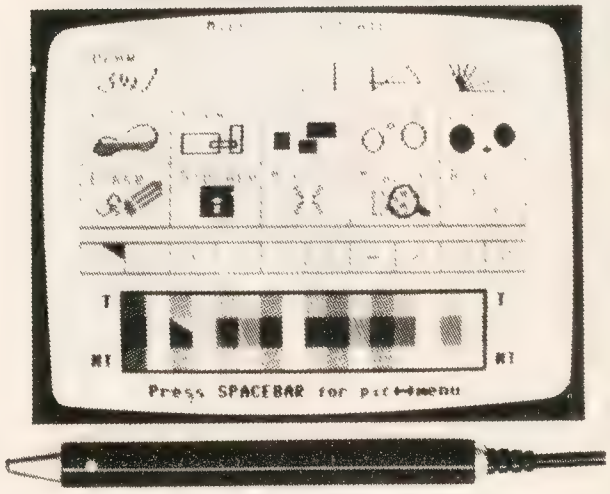

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Commodore 64 & VIC-20

$24.95 Professional Model $24.95

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Professional Light Pen. This is the TECH SKETCH Hi-Resolution model that allows you to draw fantastic pictures and professional diagrams — single-pixel accuracy! (Includes famous paint and sketch program.) List $39.95. **Sale $24.95**. *Coupon $22.95*

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Economy Model with 3 programs $16.95

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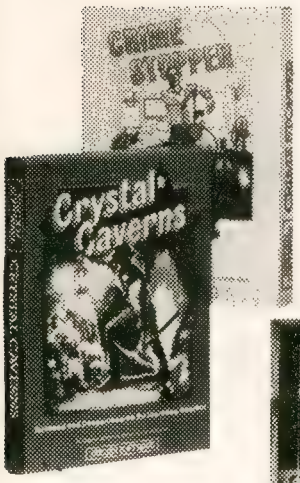
Hayden's Computer Software Price Breakthrough

Commodore 64

Your Choice

$9.95

Originally $24.95 to $34.95



Text Adventure

Crime Stopper:
Assume the role of a private eye to save a kidnapped heiress.

Crystal Caverns:
Find hidden buried treasures under an old mansion.

Strategy Games

Final Conflict:
Program robots to destroy enemy's base. Battlefield variations game can be played against computer or opponent.

King Cribbage:
Graphic version of the classic card game. Hi-res graphic representation of playing cards and cribbage board.

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Winner of the national "Othello" tournament.

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Select club, strike, direction; a must for every golfer.

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MicroAddition
MicroSubtraction
MicroMultiplication
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Color animation and cheerful tunes make learning arithmetic fun.

Match-Up:
3 matching games for pre-school that use colorful objects that teach the principles of "same," "related," and "different."

Don't Shoot That Word:
Your beginning readers will become skilled at word recognition with this fun game.

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Sargon II:
The best selling microcomputer chess game in the world. A classic game with seven levels of play.
was $34.95 **now $17.95**

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An engaging word game like Boggle, 90,000 word lexicon, dozens of game variations.
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It includes a diagnostic Pre-test for determining strengths and weaknesses in the mathematical and verbal section of the SAT. Offers test-taking strategies and two timed simulated SAT exams scored on the "800" scale.
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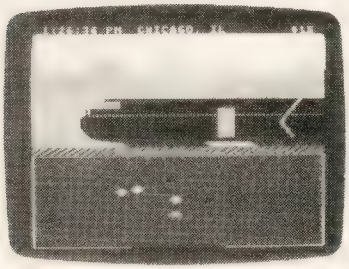
Scholastic Software

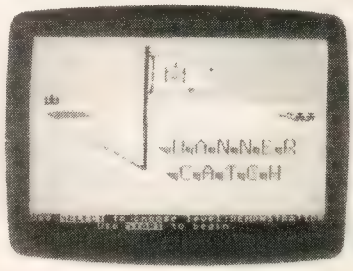
Commodore 64

Super School Savings

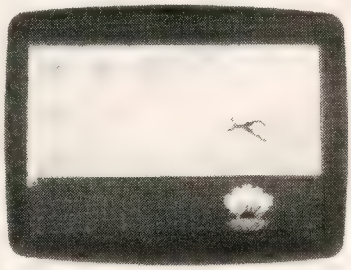
0800 Agent U.S.A. Agent USA challenges the player to intercept the Fuzzbomb by travelling across the U.S.A. You must use your knowledge of time zones, state capitals, geography, map reading, and route planning to achieve your goal. Fantastic adventure game with full color graphics and excellent sound. (Disk.) List $34.95. **Sale $24.95.**



0804 Banner Catch. This one even teaches Binary numbers. Players must work together as a team in this capture the flag game where you must get Max's flag before his robot raiders get yours. Fantastic play action and teamwork and cooperation skills make this a must for everyone. (Disk.) List $34.95. **Sale $24.95.**



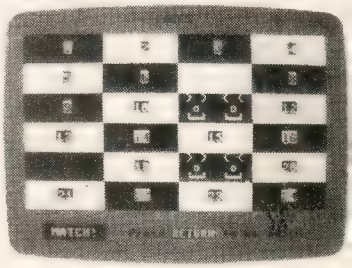
0808 Spell Diver. Sharpen spelling skills, improve reading, word recognition and retention. The player is a diver who must explore the ocean floor to find and uncover letters. The more quickly a player can guess a word the more points are scored. Sea creatures and other dangerous surprises plus a time limit make it more exciting. Fantastic graphics and sound. (Disk.) List $34.95. **Sale $24.95.**



0812 Double Feature Adventure. Two full color graphic adventures that allow the player to choose among danger, humor, excitement and chance. Plus these programs make the players stars of the adventure. Explore the microzone or the Northwoods while improving reading skills and building vocabulary. (Disk.) List $29.95. **Sale $17.95.**

0816 Tales Of Mystery. Two more famous twist-a-plot adventures that challenge the player first, to find a friend lost in a haunted house. Second, to find a statue stolen from an island. Fantastic graphic adventures. (Disk.) List $29.95. **Sale $17.95.**

0820 Square Pairs. Sharpen and improve your vocabulary, reading, and spelling skills while improving deduction and memory. You must match characters in the ready to play games then you can create your own. (1 to 4 players.) (Disk.) List $29.95. **Sale $17.95.**



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Commodore 64

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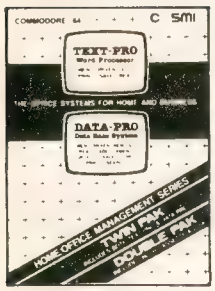
$12.95 AND UP

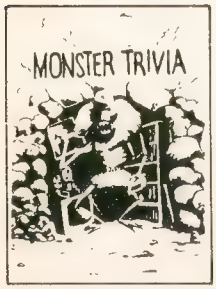
ARCADE ACTION VIDEO GAMES
Cassette $12.95
Diskette $16.95

GAMES WORTH PLAYING COSMI



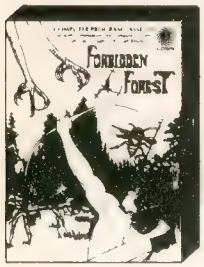
Text Pro/Data Pro

Two hot selling home/office management systems in one package. Includes both a powerful word processor and a database storage program. Available in both cassette and disk.
List $34.95. **Sale $24.95**.



Monster Trivia

A hot new concept for home and computer buffs. Over 2000 trivia questions in six categories for one to four players. With exciting high resolution graphics, colors and sounds. Available in both cassette and disk.
List $24.95. **Sale $16.95**.

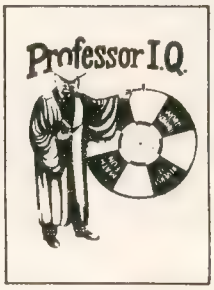


Forbidden Forrest.

Only your skill as an archer can protect you! Giant spiders, enormous bumblebees, huge leaping frogs, a phantom protected by killer skeletons, and even a fire breathing dragon try to stop you. All in stunning 3-D graphics. You'll feel like you're part of this one. Fantastic all the way around. (Tape.) List $16.95. **Sale $12.95**. (Disk.) List $21.95. **Sale $16.95**.

Professor I.Q.

This educational game is designed in an exciting, fun filled format, automatic handicapping challenge includes Word Scrambles, Math Fun, Puzzle Time, Reverse It and Strategy. Available on cassette and disk for one or two players. (Tape.) List $16.95. **Sale $12.95**. (Disk.) List $21.95. Sale $16.95.



Aztec Challenge.

You are a member of the powerful Aztec tribe. To avoid sacrificing yourself to the gods, you must compete in and complete the deadly AZTEC-OBSTACLE-COURSE. Seven phases with increasing levels of difficulty make this course challenging and keep you going for hours.
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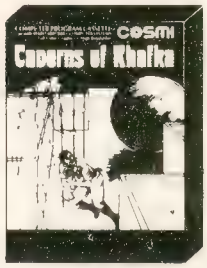

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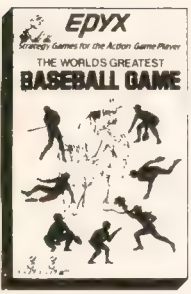

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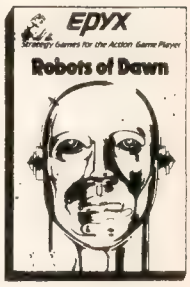

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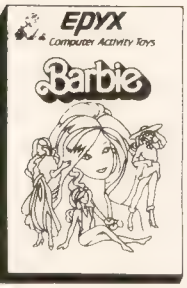

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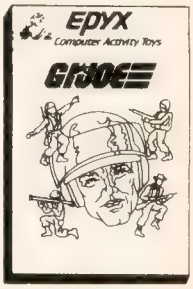

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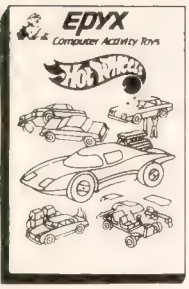

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Dan Carmichael

Key Memory Locations

This month we'll take a look at some of the more useful memory locations in the VIC. We'll see how to use them, and offer some programming hints.

The *Commodore VIC-20 Programmer's Reference Guide* lists over three pages of useful memory locations. Unfortunately, little is mentioned about how the VIC uses these locations or how you can use them in your programs.

Let's take a look at some of these memory locations, explore their uses, and work out some nifty programming techniques and subroutines you can use in your programs.

43–44 ($2B–$2C): Start of BASIC

These two bytes point to the start of BASIC program memory. The address is stored in the Low Byte/High Byte (LBHB) format (see accompanying article). By POKEing values here, you can move the start of the BASIC program storage area to a different location in RAM.

Under normal circumstances, there's no need to move the start of BASIC. The VIC and 64 have an automatic relocation feature that loads a program at the current start of BASIC storage area even though it may have been saved from another location.

For example, a BASIC program may have been saved from an unexpanded VIC where the start of BASIC is normally 4096. When you plug an 8K or larger memory expander into the VIC, the start of BASIC moves to 4608. If the program that was saved on the unexpanded VIC is loaded back into an expanded VIC using the LOAD *"filename", device number* format (where *device number* is 1 for tape and 8 for disk), it loads at the start of the BASIC program area, even though BASIC storage starts at a different location.

LOAD "filename", device number is a relocatable load—it loads a program at the start of BASIC wherever that may be. (The only exception is if the program was put on tape with a non-relocatable save, SAVE *"filename"*,1,1; there is no comparable non-relocatable save for disk.) The LOAD *"filename", device number, 1* (we've added a ,1) format is a non-relocatable load, and loads the program into the same memory locations from where it was saved. Non-relocatable loads are used primarily for machine language (ML) programs.

Under certain circumstances, though, moving the start of BASIC is necessary. Using custom characters on a VIC with 8K or more memory expansion is one such case. Because the VIC chip, which reads the character generator, cannot "see" into expansion RAM, you cannot place your custom characters at the top of BASIC RAM as you might do with the unexpanded VIC. The custom characters have to go somewhere between 4096 and 8192 (and you don't want them smack dab in the middle of BASIC).

In this case, you need to move the start of BASIC up so that you can load the custom characters into an area of RAM the VIC chip can access. Moving the BASIC storage area to begin at location 5632 instead of 4608 provides 512 bytes starting at 5120 for the custom characters. To do this, POKE 44,22:POKE 5632,0:NEW. Each time you increase the value in memory location 44 by 1, you move the start of the BASIC program area up one page, or 256 bytes. Each time you increase the value in location 43, you move the start of BASIC program area up one byte.

When you move the BASIC program storage area, it's best to do it without a BASIC program in memory. Otherwise you're likely to lose all or part of the program.

If you're combining machine language with your BASIC programs, moving BASIC up will provide you with a safe area to put your ML subroutines. You can POKE the ML into the protected area below BASIC.

Here's a short program that will move the start of BASIC storage up one to ten pages (256–2560 bytes). Type it in, save it, then run it. When prompted, enter how many pages you want to move BASIC up (1–10). Using the dynamic keyboard technique, the program moves BASIC, enters NEW, and leaves your VIC ready to load or enter a program.

```
10 PRINT"{CLR}MOVE BASIC UP HOW MANYPAGES
   ? (1-10)"
20 INPUTPG
30 IFPG<1ORPG>10THEN10
40 N=PEEK(44)+PG
50 PRINT"{CLR}POKE44,";N":POKE(256*";N"+P
   EEK(43))-1,0:NEW"
60 POKE631,19:POKE632,13:POKE198,2
```

45–46 ($2D–$2E): End of BASIC program/start of non-array variables

These memory locations point to one byte past the end of the BASIC program currently in memory.

As a BASIC program runs, the operating system builds variables (but not array variables) starting here and upwards into memory. This pointer (as well as memory locations 174 and 175) can also be useful in finding the end of your BASIC program.

55–56 ($37–$38): End of free RAM

This pointer is much like memory locations 43 and 44 except that it signals the top of free RAM, or the end of available user BASIC memory.

If you think of memory as a football field, locations 43 and 44 point to the beginning of memory (your own goal line) and 55 and 56 point to the end of memory (the other goal line). BASIC programs begin at the beginning of memory and variables are stacked on top of the BASIC program, which is why you lose variable values when you add, delete, or change a BASIC line. Arrays are put on top of the other variables. Dynamic strings, on the other hand, begin at the top of memory (the opposite goal line) and extend downward in memory. (Dynamic strings are those that require evaluation, like A$ in A$=A$+B$, or A$=CHR$(65), or INPUT A$.) Whatever is left between the end of arrays and the beginning of strings is free memory. When the pointer to the end of arrays meets the pointer to the beginning of strings, you get an OUT OF MEMORY error.

By POKEing lower values into locations 55 and 56, you can lower the top of RAM, thus providing a safe place to store your custom characters (in the unexpanded VIC) or machine language routines. Each time you decrease the value in location 56 by one, the top of memory moves down one page (256 bytes). Decreasing the value in location 55 moves the top of memory down one byte. The memory is still there, you've simply fooled BASIC into thinking it's not available for string variables. If you plan to lower the top of memory, you should do it *before* defining any strings, or you may lose them.

For example, if you turn your unexpanded VIC off then on again and enter: PRINT PEEK(55) + 256 * PEEK(56) you should get 7680 which is the end of user BASIC memory. Now if you enter POKE 56,(PEEK(56)−1):CLR (CLR erases variables and is necessary whenever you change the top of memory pointer) then reenter the above line, you'll get a value of 7424. By decrementing the value of location 56 by one, we've moved the top of RAM to 7424. The 256 bytes between 7424 and 7680 are now a safe place to put your ML program or custom characters.

Here's a program that will move the top of BASIC RAM down from one to ten pages. When prompted, enter 1 to 10 then press RETURN. The program will automatically move BASIC down and leave your VIC ready to use.

```
10 PRINT"{CLR}MOVE BASIC DOWN HOW
   {3 SPACES}MANY PAGES (1-10)?"
20 INPUTN:IFN<1ORN>10THEN10
30 POKE56,(PEEK(56)-N):CLR
```

67–68 ($43–$44): INPUT, GET, and READ information source pointer

These two bytes point to the source of information being input into the computer when using the BASIC INPUT, GET, or READ commands. In the case of INPUT and GET, they point to the *BASIC input buffer*. When using READ, they point to the memory location of the DATA statement.

The *BASIC input buffer* is an area of memory that runs from memory locations 512 to 600. This is 89 characters in length, and corresponds to the 88 character BASIC lines or the 88 characters allowed when using the INPUT command (the extra byte is used as a marker for the end of input). When you use an INPUT statement in your BASIC program, the information is temporarily stored in this buffer until a carriage return is encountered. This pointer will point one byte past the last character entered in the input buffer. As an example, enter the following program:

```
10 PRINT"{CLR}ENTER CHARACTER(S)":INPUTCH
   $
20 PRINT"{DOWN}BUFFER POINTER=";PEEK(67)+
   256*PEEK(68)
```

Run the program and when prompted by the INPUT statement, enter A then press RETURN. As

How The VIC Stores Numbers

Many of the pointers discussed in this month's VICreations are pairs of bytes that store numbers in the Low Byte/High Byte (LBHB) format. Many microcomputers use this format to store large numbers.

Because a single byte can hold a number no larger than 255, two bytes are needed to store numbers 256 or greater. The LBHB method can store numbers from 0 to 65535. Numbers are broken down and stored in memory with the *least significant byte* (LSB) first, and the *most significant byte* (MSB) last.

The MSB is derived by dividing the number you wish to store by 256, then storing the integer value in the MSB. The remainder of the division is then stored in the LSB. Use the following formula to read LBHB numbers in memory:

```
NUMBER = LSB + (256 * MSB)
```

As an example, let's use memory locations 43 and 44, which point to the start of BASIC program storage. Using the above formula, we can find the start of BASIC by entering:

```
PRINT PEEK(43)+(256*PEEK(44))
```

The result should be 4097 if you have an unexpanded VIC, 4609 with 8K or more expansion.

Storing LBHB Numbers

Let's say you wish to move the start of BASIC to memory location 7000. To do this, you have to POKE the proper values into memory locations 43 and 44 using the LBHB format. Here's how it's done:

First, divide 7000 by 256 (which gives you 27 with a remainder of 88), then POKE the integer result, the MSB, into memory location 44.

```
7000 / 256 = integer 27, so POKE 44,27
```

Next, store the remainder of this division into the LSB, which is memory location 43.

```
7000 - (256*27) = 88, so POKE 43,88
```

Now we've POKEd a value of 88 into memory location 43, and a 27 into location 44. If we use the formula to read the values in LBHB format, we get:

```
Beginning of BASIC = PEEK (43) +
(256*PEEK(44))
or 7000 = 88 + (256*27)
```

To actually change the beginning of BASIC requires more than just POKEing new numbers into this pointer. The byte right before the first byte of BASIC has to contain a zero, so you'd have to POKE 6999,0 and then type NEW (to reset some pointers used by variables).

Reading And Storing

To automatically read or store numbers using the LBHB format, use these two formulas:
To read an LBHB number, where N is the number:

```
N = BYTE1 + (256 * BYTE2)
```

To store an LBHB number, where N is the number to be stored:

```
HB = INT(N/256):POKE BYTE1, N-
(HB*256):POKE BYTE2,HB
```

you can see, the pointer value here is 513. The character code for the letter A was placed in the first byte of the input buffer (512), and the pointer was then incremented one byte past it. Run the program again, but this time when prompted, enter: ABCDEFGHIJ then press RETURN. The pointer is now indicating 522, one byte past the 10 characters entered.

When using the READ statement, the pointer works in much the same way, except that it points either to the zero byte at the end of each DATA statement or to the commas between DATA items. The operating system uses a zero to indicate the end of a BASIC line. Enter and run this example program after turning your unexpanded VIC off then on:

```
5 PRINT"{CLR}"
10 READA$
20 IFA$<>"END DATA"THENPRINTA$:GOTO10
30 PRINT"{DOWN}LAST DATA=";PEEK(67)+256*P
   EEK(68)
50 DATA FRED
60 DATA GEORGE
70 DATA END DATA
```

The value displayed by the pointer here is 4215. This is one byte past the last character in DATA statement 70.

These pointers can be useful in monitoring input into the system, whether it's via the key-

board or a READ statement.

For instance, you might have an application where you want the user to enter a number 10 digits or less. It would be easiest to monitor the size of the number using string commands. For example, enter:

```
A=123
```

Then enter:

```
PRINT LEN(STR$(A))-1
```

As you can see, by first converting the variable A to a string (STR$ (A)), then determining the length of the string minus one (because negative numbers are preceded by a minus sign, positive numbers by a space) will correctly give us a 3.

However, numbers containing 10 or more digits present a problem because the VIC automatically converts these numbers into scientific exponentiation form. As an example enter:

```
A=1234567890:PRINTA
```

The result here is 1.23456789E+09 (meaning 1.23456789 times ten to the ninth power). This won't do us much good because if we try to use the above string/length conversion command on this number, we'll get a value of 14. The operating system treats the decimal point and the "E" denoting exponentiation as part of the string. For example, enter:

```
PRINT LEN(STR$(A))-1
```

This is where our pointers come into use. By using the INPUT command and the pointers in the program, we can accurately determine the length of input up to 88 characters long. Here's a program which is designed to allow the user to enter a number containing only 1 to 10 digits:

```
10 PRINT"{CLR}ENTER A NUMBER,":PRINT"LIMI
   T 10 DIGITS,":PRINT"NO COMMAS."
20 INPUTA
30 IFPEEK(67)+256*PEEK(68)>522THENGOTO10
40 PRINTA
```

When prompted to enter a number, enter 1234567890. As indicated, the length here is 10 digits, and the program accepts the input as valid.

Now run the program again, entering 12345678901. In this case, the number was not accepted because it is 11 digits in length. The key to this technique is line 30, which checks to see if the pointers were incremented past memory location 522 (522 minus the beginning of the buffer, 512, = 10 digits), and if so, refuses to accept the data.

139–143 ($8B–$8F): Random seed value

These bytes are the root (or "seed") of the BASIC RND command. When the RND command is used in a BASIC program, these bytes are multiplied, added, and otherwise scrambled in hopes of creating a truly random number. But they have limited use in BASIC programs, where the RND command can be used.

However, when programming in machine language, you can use the random seed to produce a random number without branching back to BASIC. To do this, JSR (Jump to SubRoutine—much like the GOSUB in BASIC) to memory location $E094 (decimal 57492). This is the beginning of the Kernal subroutine that "spins" the random seed bytes, and produces a random number. After the JSR, you can process any of the five random seed bytes as you wish. Memory location 143 seems to be the most random of the five. (For more information on random numbers and the random seed, refer to "Inside Random Numbers" in the June 1984 issue of COMPUTE!'s GAZETTE.

144 ($90): STatus word (ST)

This byte corresponds to the BASIC reserved variable ST (STATUS). When you open or close channels, or perform input/output operations, this byte indicates the final status of the operation.

As is true with the random seed, it has limited use in BASIC where you can use the ST variable itself. But in machine language, this byte is handy for checking the status of an input/output operation.

An input/output operation will set various bits in this memory location as noted:

Cassette:

Bit 2 = Short Block
Bit 3 = Long Block
Bit 4 = Unrecoverable error (read), mismatch
Bit 5 = Checksum Error
Bit 6 = End of File
Bit 7 = End of Tape

Serial devices:

Bit 0 = Time Out (Write)
Bit 1 = Time Out (Read)
Bit 6 = EOI (End of Input)
Bit 7 = Device Not Present

Checking location 144 can be very useful when you're reading a file of unknown length from tape or disk: After opening the file, use GET# to get bytes one at a time, followed by the line:

```
IF PEEK(144)=64 THEN CLOSE file number:END
```

or the equivalent:

```
IF ST=64 THEN CLOSE file number:END
```

When bit 6 is set (when location 144 has a value of 64), that means you've reached the end of the file and it's time to close it.

Time Clock

David W. Martin

Put a digital clock on your computer screen with this machine language program. For the VIC and 64.

There's a clock inside your computer. It starts ticking immediately when you flip the on switch and continues until you turn your VIC or 64 off.

It's called the jiffy clock, a three-byte section of memory that ticks every sixtieth of a second (jiffy). You can read the time in jiffies with PRINT TI or find how many seconds it's been since you turned on the computer with PRINT TI/60. To get a more readable time, PRINT TI$ gives you hours, minutes, and seconds (131500, for example, would be 13 hours, 15 minutes, 0 seconds, or a quarter past one in the afternoon).

TI and TI$ are called reserved variables. They are reserved for timekeeping only; you can't use them in your programs, unless it's for checking the time. To set the clock, you can define TI$, using the HHMMSS (Hours, Minutes, Seconds) format inside quotation marks. Enter TI$="063000" to set the clock to 6:30 a.m., for example. You can't set TI directly; you have to set TI$, which affects both time variables.

The Stopwatch Function

The jiffy clock sometimes comes in handy. When you're running benchmark tests, you can set the clock to 000000 just before running the routine being checked. When it's done, PRINT TI to see how much time the program took to run. In this way, you find the fastest ways of doing things like alphabetizing. It's like using a stopwatch on a programming technique.

The clock can also be used as an alternative to FOR–NEXT delay loops. Define a variable as TI+60 (for a one second delay) and keep looping around until TI is greater than or equal to the variable.

If you need to keep time in a program like a racing game or a touch typing program, you simply read the jiffy clock.

Commodore 64 owners have two Time Of Day (TOD) clocks, in addition to the jiffy clock. They're built into one of the interface chips. The TOD clocks count in tenths of seconds rather than sixtieths.

A Time Display Window

You could use a one line program to continually display the time, such as:

```
1 PRINT"{CLR/HOME}";TI$:GOTO1
```

except for one problem. To keep the time updated, the program would have to be running all the time, which means you couldn't use the computer for anything else.

"Time Clock" eliminates this problem. It prints the time in the upper righthand corner of the screen, and leaves the computer available for other tasks. A machine language interrupt drives the program. In other words, it runs in the period when the operating system does its housekeeping (like updating the screen).

To use Time Clock, type it in and save it before running. If the internal checksum does not match up, check the DATA statements (and remember to save your corrected version).

Next, you will be asked to set the clock. The VIC version operates in military time (10:00 p.m. should be entered as 22 hours, 00 minutes, 00 seconds). The 64 version uses a 12-hour clock, with a.m. and p.m. Both versions wrap around

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and reset at midnight.

After the clock is set, the time will appear in the upper corner. You can press STOP and type NEW without affecting the clock. RUN/STOP-RESTORE will erase the clock. To regain it, you'll have to SYS828 (VIC version), SYS49171 (64 version).

Both versions run independently from the jiffy clock, so you can use TI and TI$ as clocks which are separate from the time displayed on the screen.

Because the jiffy clock does not keep correct time when information is being written to or read from the cassette, the 64 version of Time Clock reads a TOD clock, which is not affected by tape.

The 64 version counts in tenths of seconds, the VIC version in sixtieths. The VIC program also uses the function keys. Press f1 to stop the clock, f3 to start the clock, f5 to clear the clock, and f7 to set the time. With these keys, the program can be used as a computerized stopwatch.

The VIC version is stored in the cassette buffer, so you must avoid cassette operations while running the program. RUN/STOP-RESTORE allows you to save or load from tape, but you'll lose the clock function.

See program listings on page 195.

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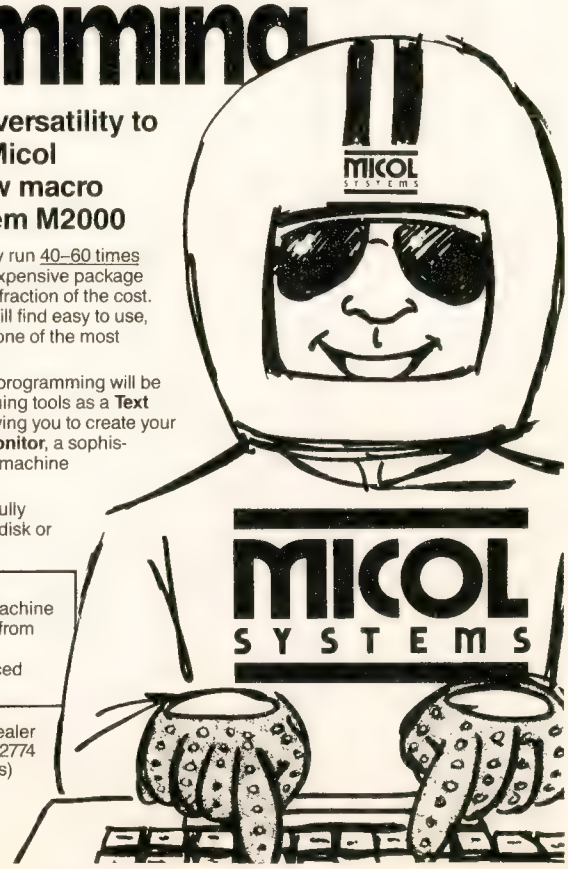

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Cassette Index

Paul N. Peasley

If you're a tape user, here's a short program that will help you organize each of your tapes by creating a built-in index. For the VIC or 64.

If you're tired of accumulating a lot of small pieces of paper with lists of each tape's files, "Cassette Index" might be a worthwhile alternative. This program offers a built-in index for each side of each cassette—a list of the contents and the approximate locations for each of the programs.

Up To 21 Programs Per Tape

If you've glanced ahead at the program listing, you'll notice that it's very short. However, before you start typing it in, be sure to read the instructions so you can use the program properly. There's a bit of extra work up front, but you'll find the payoff is well worth the effort.

First, turn on your VIC (any expansion) or 64 and type in the program, but pause when you get to the DATA statements (beginning with line 39). These statements will contain the actual names and locations (counter readings) for your programs. Note that the program names and counter readings are entered in pairs, separated by a comma, and that the entries PROGRAM NAME, COUNTER are used in the DATA statements to separate each set of eight pairs. The program allows you to catalog up to 21 programs on one tape.

Continue typing in the program until it's complete. (Include the sample DATA statements as listed.) Next, save it as the first program on a blank cassette, press STOP on the Datassette, and type RUN. If you discover any typing errors, correct them, and again save the program as the first on your tape. (From this point on, we'll refer to this tape with Cassette Index as the *destination* tape, since it will be the tape to which your programs will be saved. The tapes from which we get the programs we'll call the *source* tape.)

Since you will be copying programs from one tape to another, you might want to stop and think about how you want to organize the new tapes. Perhaps you could put all arcade-type games on one tape, adventure games on another, and programming utilities on yet another. Since it's easier to get to the first program on a tape, you should think about starting with the programs you use most, your favorites. When you have a rough plan, you can proceed.

Next, remove the destination tape (do not rewind it, leave the tape positioned just after the indexer program). Enter NEW, place the source tape in the Datassette, and load a program into memory. At the READY prompt, remove the source tape and insert the destination tape. Reset the counter to 000. Now save the program in memory to the destination tape.

The next step is to write on a sheet of paper the program name and the length (the counter reading after the save is completed). A typical example might look like:

PROGRAM NAME	LENGTH
Ramtest	009

For each program you wish to save on the rest of the source tape, follow the procedures we've just outlined, making sure to reset the tape counter to zero before saving each program on the destination tape.

A Little Redundancy

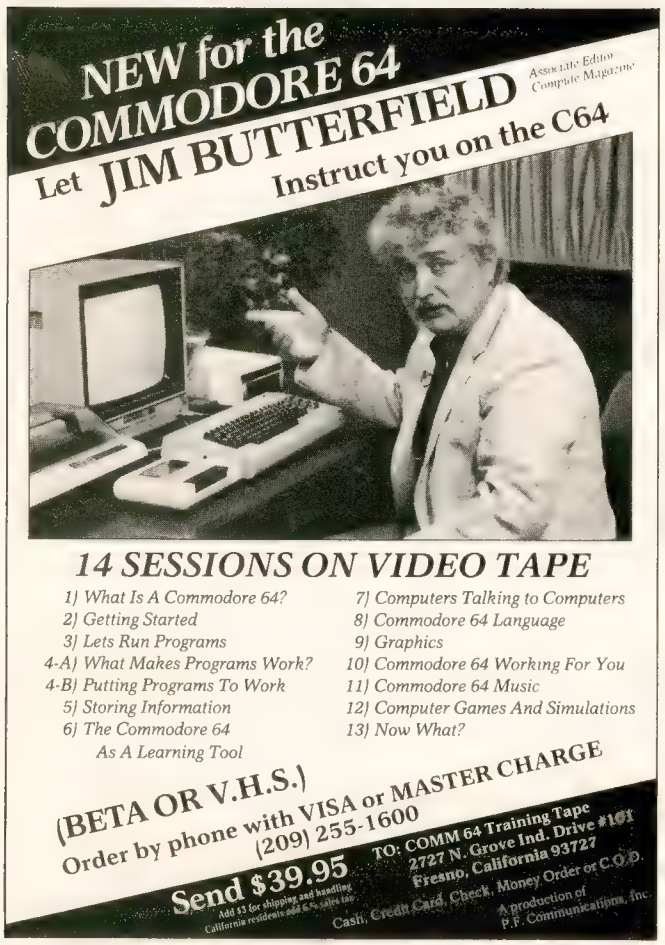
The remaining steps may seem a bit tedious, but if you've kept a manual log of your tape contents, you've done most of this procedure already. One more bit of repetition, however, will result in automated tape files and more than make up for any extra time spent now.

On your sheet of paper, next to Program Name and Length, enter a new heading to the right called Counter Reading. For the first program listed, enter 000. Then add the length of this first program and enter the result under Counter Reading for the next program. For

example, if the first program was 009 in length, you should enter 000 + 009 = 009 for the *second* program's counter reading. When you've manually calculated all the counter reading values for each program, you'll notice one value left over at the end without an accompanying program name. This reading is the tape location where the next program will be saved. Assign this blank filename the temporary name of *NEXT PRG*.

When you've saved as many programs as you wish, put the destination tape into the Datassette and rewind it to the beginning. Enter NEW, then load the Cassette Index program. When loading is completed, press STOP on the recorder and LIST Cassette Index to the first DATA statement (line 39). Using the list on your sheet of paper, change DUMMY NAME01 to the name of your first program (insert or delete characters as necessary). Because the first program begins at counter reading 000, this will remain unchanged in the DATA statement as written.

Next, change DUMMY NAME02 to the name of the next program on your list, and change the 000 reading after this name to the correct value as shown on your list. Continue modifying the DATA statements in this manner using the information on your list.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The Payoff

After completing all the DATA statement changes, rewind the destination tape to the beginning and save the newly modified Cassette Index. At the READY prompt, type RUN and follow the directions on your screen. To add more programs to Cassette Index and the tape:

1. Load Cassette Index (destination tape).
2. Reset the program counter to 000.
3. Determine the program name and counter reading for the last program saved on the cassette.
4. FAST FORWARD to that reading, then press STOP on the recorder.
5. Enter VERIFY *"program name"* and press RETURN. (The computer will read, but not load the program. This technique positions the tape at the next location available for saving a program. Ignore the ?VERIFY ERROR message.)
6. Make a note of this (beginning) counter reading.
7. Remove the destination tape, but *do not rewind it.*
8. Insert the source tape and load the program to be added to the destination tape. Make a note of the program name.
9. When loading is complete, make a note of the final counter reading.
10. Insert the destination tape (with Cassette Index), but *do not rewind it.*
11. Save the program to the destination tape.
12. Rewind the destination tape to the beginning.
13. Enter NEW, then load Cassette Index, already on the tape.
14. LIST the DATA statement containing the program name (step 3).
15. Change the next program name to the name of the program you added to the cassette.
16. Change the counter reading value to the value of the beginning counter reading you noted in step 6.
17. Change the counter reading value for the next (dummy) program to the value of the final counter reading which you noted in step 9.
18. Rewind the tape.
19. Save the newly modified Cassette Index at the beginning of the tape.
20. VERIFY this save.

If you'd rather not type in the program, send $3, a self-addressed, stamped mailer, and a blank tape to:

Paul N. Peasley
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See program listing on page 198.

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Disk/Tape Backup

N. A. Marshall

If you have a Datassette and disk drive, this program can provide extra security by doing an automatic backup of files from disk to tape or vice versa. For the VIC (with 8K or more expansion) and 64.

Most all computer owners have at least once become exasperated with a lost program or one that refuses to load. "I should have backed it up" is a common refrain. It can be a frustrating experience. "Disk/Tape Backup" is a security utility for those with tape and disk drives. It's a two-phase—backup and restore—program that handles sequential and program files. The backup phase, or process, is for disk to tape; the restore phase is for tape to disk.

At the start of the backup process, the program saves itself as the first program on the tape. This ensures that there is a copy for restoring files later. During backup, the program dates the disk in a file called SYS DATE. It also writes the time and date and a directory of all files to be processed onto the tape.

Selecting Disk Files

Before dating the disk, the program asks if all files are to be processed, and the tape size in minutes. It uses the tape size information in deciding when to call for another cassette.

If all files are to be processed, the program reads the directory, lists it, and puts it into a table. If only selected files are to be processed, the program reads the directory, displays each filename and asks if it is to be processed. The files you selected are then put in the table. When the directory is finished, the table is sorted and the backup commences. This process can take a couple of hours because of the speed of the tape drive.

Program Variables

BH	Number of bytes that tape file header uses (300)
BD	Number of bytes per disk block (256)
BK	Block number
BM	Number of bytes per half minute of tape (840)
BO	Border address (53280)
DA	Dash
DIR	Directory file number (8)
FP	Disk file file number (5)
K0	Constant 0
K1	Constant 1
K2	Constant 2
K3	Constant 3
K4	Constant 4
LN( )	Number of blocks in each file
NB	Number of bytes written
NC	Tape record size
NE	Number of equal characters
NF	Number of files
PS	Size of DTB in bytes (approx. 8000)
SP	Space (32)
TB	Tape size in bytes
TM	Tape size in minutes
AF$	All switch
AN$	Normal/abnormal switch
BR$	Backup/restore switch
C0$	CHR$(0)
CO$	Comma
DA$	Date
DN$	Disk name
FM$	Name in bring down procedure
NA$( )	Names of files to be processed
RC$	Record code
SP$	Spaces
T$( )	Types of files
TY$( )	File types for files to be processed
VN$	Version (2)

During the backup, typing a P when prompted causes the program to stop and ask if you wish to quit. Press Q to close all files and end the run.

The Restore Phase

The second phase, restoring, is similar in operation to the backup phase. The process is similar,

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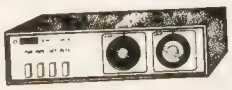

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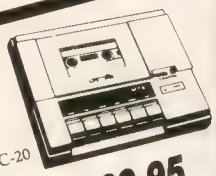

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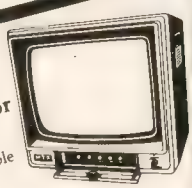

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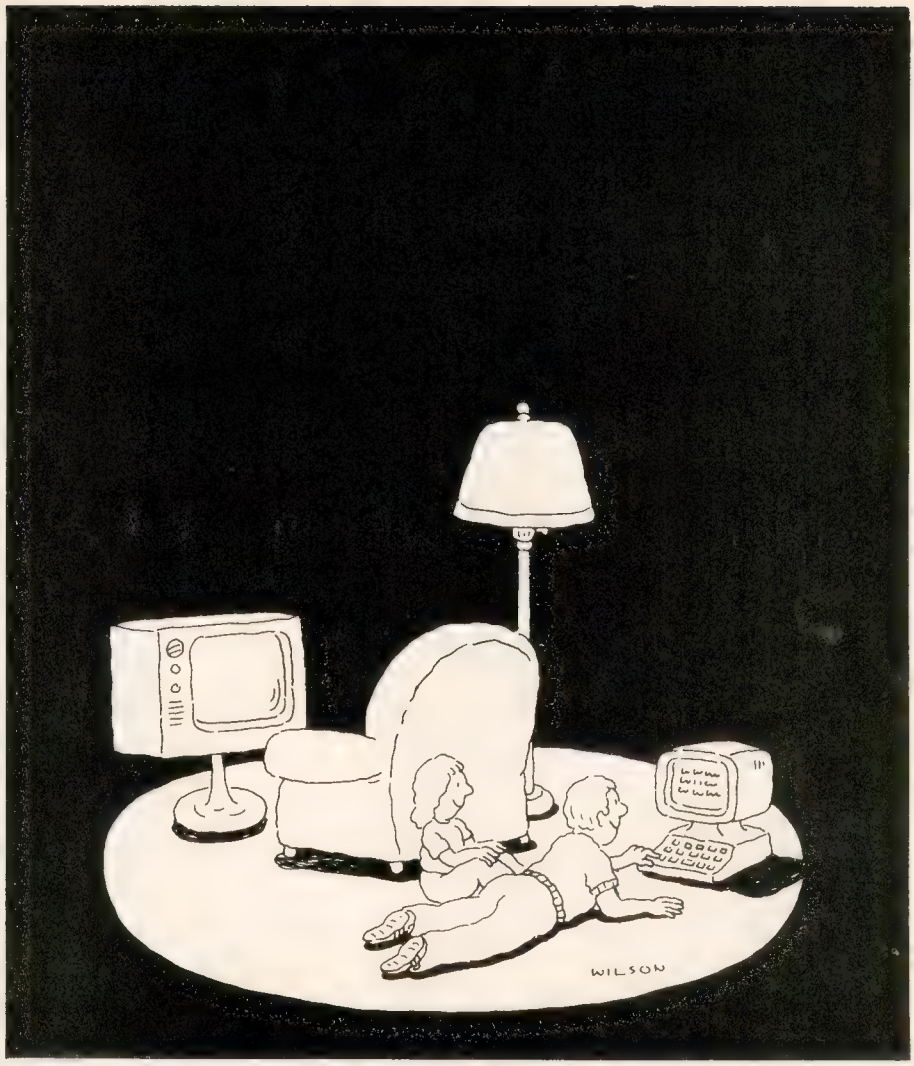

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but direction is reversed. It backs up from tape to disk. Be careful, files on disk will be replaced by files of the same name from tape. Before the restore starts, the program offers to reformat the disk, so a brand new unformatted disk will work just fine. Program design is straightforward, and screen instructions and prompts should be clear even to beginners.

The internal clock loses time when writing and reading disk and tape files. A count of characters processed is kept and used in an attempt to reset the clock at the end of processing of each tape. However, this is not totally accurate.

A 90-minute tape can hold up to 140K. Data is packed before it is written to tape. For example, multiple spaces are stored as CHR$(232)+CHR$(*count*), multiple dashes as CHR$(245)+CHR$(*count*), and multiple occurrences of other characters are stored as CHR$(231)+CHR$(*count*)+CHR$(*other*), where *count* is the number of times the character is repeated. CHR$(230) means skip this but not next character.

See program listing on page 199.

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Now, it depends, as it always did, on you. As we move closer to Election Day, let's all remember: one vote does make a difference.

Leonard H. Goldenson
Chairman of the Board

Leonard H. Goldenson

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NEWS & PRODUCTS

More 64 Memory

Mosaic Electronics is introducing *Access-M*, a memory expansion system for the Commodore 64 which gives the computer access to 64K or 128K of RAM through bank-switching techniques.

The system is based on Mosaic's "scanning RAM" technology, called *RAMSCAN*, which can access any position in the *Access-M* memory through a memory window at $C000. Programs and data of any length can be accessed through this 4K window. Or the 4K block can be split into two 2K windows. *RAMSCAN* allows BASIC and machine language programs to be stacked through the normal $C000 address simultaneously and accessed immediately.

The *RAMSCAN* circuit resides on a custom chip, *MCHIP*, and supports *MDISK*, a RAM disk package. *MDISK* is accessed with normal BASIC commands or Kernal calls, and operates without interfering with other programs.

Access-M is available in versions with 64K or 128K. Future enhancements will include a one-megabyte memory expander with an independent power supply, so data is not lost when the computer is turned off.

Telephone Number Correction

Note: The telephone number published with the News and Products announcement for HyTech in the August issue of COMPUTE!'s GAZETTE is not the number for that company or for any private business. The number used is that of an agency of the federal government and was erroneously supplied to COMPUTE! Publications.

35 New BASIC Commands For VIC-20

Air Software has announced *Magic BASIC*, a software extension to VIC-20 BASIC which adds 35 new commands.

The program loads into VIC-20s with 10K or more of free memory, and uses about 7K of memory for the high-resolution screen and the machine language routines added to VIC BASIC.

Among the routines are TRACE and variable DUMP, as well as a set of graphics commands for plotting on a 176 × 160 pixel screen. The graphics commands include SHAPE, which allows the use of custom characters or normal VIC characters on the high-resolution screen.

The custom character set can be located anywhere in memory, and can be longer than 255 characters. The program is not copy-protected.

Available on cassette, *Magic BASIC* retails for $24.95.

Air Software
P.O. Box 1109
Stockbridge, MA 01262
(413) 298-4943

Home Information/Telecommunications System For 64

Chemical Bank has announced that its PRONTO home information and banking system is now compatible with the Commodore 64.

The system works on a 64, modem, and PRONTO software, allowing subscribers to perform such tasks as bill paying, transferring funds, determining bank balances, tracking a budget, and balancing checkbooks.

In addition, subscribers can

send electronic mail to other PRONTO subscribers, and can access certain information services available through the system, such as economic and business briefs, tax guides, magazine articles, and interest rates.

PRONTO is available for a $12 per month service charge, which includes the software.

Chemical Bank
Metropolitan Division
52 Broadway
New York, NY 10004
1-800-782-1100

New Peripherals For VIC And 64

Maxtron has introduced several new peripherals for the VIC and 64: a printer interface, a dot-matrix printer, a power supply, a cassette drive, and speech synthesizer.

The Maxprint+G printer interface ($89.95) plugs into the serial port. It translates from serial-Commodore ASCII to Centronics parallel true ASCII. No modifications or extra cables are required.

The Maxprint-80 ($349) prints bi-directionally at 80 cps, with an 8 × 9 square dot matrix, user-selectable character and graphic styles, and sprocket or friction feed.

The DC-1 cassette drive ($59.95) includes a built-in counter, SAVE indicator, PAUSE, and AUTO STOP.

The Chatterbox ($59.95) speech synthesizer for the VIC-20 is a cartridge which produces recognizable words through a TV/monitor speaker. The power supply retails for $35.

Maxtron
1825A Durfee Avenue
South El Monte, CA 91733
(818) 350-5706

New 64 Terminal Software

Versaterm II, a terminal software program for the Commodore 64, has been announced by Electrosharp.

Data can be downloaded to a 43,000-byte buffer or directly to disk or printer. Downloaded image files and BASIC listings can then be converted into operable programs.

Phone numbers can be stored, recalled, and automatically dialed when used with the 1650 Automodem. If the line is busy, the number can be automatically redialed until a connection is made.

Versaterm II allows the user to store, retrieve, and send up to 25 keywords or phrases with a single keystroke.

The program is available on tape or disk for $34.95.

Electrosharp
1981 Sandalwood Drive
Santa Maria, CA 93455
(805) 922-4095

Speed Reading On The 64

Evelyn Wood Reading Dynamics, a familiar name in the field of reading skills and comprehension, has introduced software to teach those skills on the Commodore 64.

Produced and distributed by Timeworks, Inc., the *Evelyn Wood Dynamic Reader* program includes exercises and comprehension quizzes aimed at improving both reading speed and comprehension.

Suggested retail price is $69.95.

Timeworks, Inc.
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COMPUTE!'s GAZETTE *welcomes announcements of new products for VIC-20 and Commodore 64 computers. Please send press releases, photos, and product samples (if available) well in advance to: Selby Bateman, Features Editor,* COMPUTE!'s GAZETTE, *P.O. Box 5406, Greensboro, NC 27403.*

New product releases are selected from submissions for reasons of timeliness, uniqueness, available space, and general interest. Readers should be aware that News & Products often contains an edited version of material submitted by vendors. We are unable to vouch for its accuracy at time of publication.

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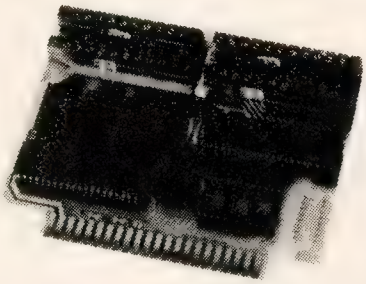

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A Beginner's Guide To Typing In Programs

What Is A Program?

A computer cannot perform any task by itself. Like a car without gas, a computer has *potential*, but without a program, it isn't going anywhere. Most of the programs published in COMPUTE!'s GAZETTE for Commodore are written in a computer language called BASIC. BASIC is easy to learn and is built into all VIC-20s and Commodore 64s.

BASIC Programs

Each month, COMPUTE!'s GAZETTE for Commodore publishes programs for both the VIC and 64. To start out, type in only programs written for your machine, e.g., "VIC Version" if you have a VIC-20. Later, when you gain experience with your computer's BASIC, you can try typing in and converting certain programs from another computer to yours.

Computers can be picky. Unlike the English language, which is full of ambiguities, BASIC usually has only one "right way" of stating something. Every letter, character, or number is significant. A common mistake is substituting a letter such as O for the numeral 0, a lowercase l for the numeral 1, or an uppercase B for the numeral 8. Also, you must enter all punctuation such as colons and commas just as they appear in the magazine. Spacing can be important. To be safe, type in the listings *exactly* as they appear.

Braces And Special Characters

The exception to this typing rule is when you see the braces, such as "{DOWN}". Anything within a set of braces is a special character or characters that cannot easily be listed on a printer. When you come across such a special statement, refer to "How To Type In *COMPUTE!'s GAZETTE* Programs."

About DATA Statements

Some programs contain a section or sections of DATA statements. These lines provide information needed by the program. Some DATA statements contain actual programs (called machine language); others contain graphics codes. These lines are especially sensitive to errors.

If a single number in any one DATA statement is mistyped, your machine could "lock up," or "crash." The keyboard and STOP key may seem "dead," and the screen may go blank. Don't panic – no damage is done. To regain control, you have to turn off your computer, then turn it back on. This will erase whatever program was in memory, *so always SAVE a copy of your program before you RUN it*. If your computer crashes, you can LOAD the program and look for your mistake.

Sometimes a mistyped DATA statement will cause an error message when the program is RUN. The error message may refer to the program line that READs the data. *The error is still in the DATA statements, though.*

Get To Know Your Machine

You should familiarize yourself with your computer before attempting to type in a program. Learn the statements you use to store and retrieve programs from tape or disk. You'll want to save a copy of your program, so that you won't have to type it in every time you want to use it. Learn to use your machine's editing functions. How do you change a line if you made a mistake? You can always retype the line, but you at least need to know how to backspace. Do you know how to enter inverse video, lowercase, and control characters? It's all explained in your computer's manuals.

A Quick Review

1. Type in the program a line at a time, in order. Press RETURN at the end of each line. Use backspace or the back arrow to correct mistakes.

2. Check the line you've typed against the line in the magazine. You can check the entire program again if you get an error when you RUN the program.

3. Make sure you've entered statements in braces as the appropriate control key (see "How To Type *COMPUTE!'s GAZETTE* Programs" elsewhere in the magazine).

We regret that we are not able to respond to individual inquiries about programs, products, or services appearing in COMPUTE!'s GAZETTE *for Commodore due to increasing publication activity. On those infrequent occasions when a published program contains a typo, the correction will appear in the magazine, usually within eight weeks. If you have specific questions about items or programs which you've seen in* COMPUTE!'s GAZETTE *for Commodore, please send them to Gazette Feedback, P.O. Box 5406, Greensboro, NC 27403.*

How To Type In *COMPUTE!'s GAZETTE* Programs

Many of the programs which are listed in COMPUTE!'s GAZETTE contain special control characters (cursor control, color keys, inverse video, etc.). To make it easy to know exactly what to type when entering one of these programs into your computer, we have established the following listing conventions.

Generally, any VIC-20 or Commodore 64 program listings will contain words within braces which spell out any special characters: {DOWN} would mean to press the cursor down key. {5 SPACES} would mean to press the space bar five times.

To indicate that a key should be *shifted* (hold down the SHIFT key while pressing the other key), the key would be underlined in our listings. For example, S would mean to type the S key while holding the shift key. This would appear on your screen as a "heart" symbol. If you find an underlined key enclosed in braces (e.g., {10 N}), you should type the key as many times as indicated (in our example, you would enter ten shifted N's).

If a key is enclosed in special brackets, <x>, you should hold down the *Commodore key* while pressing the key inside the special brackets. (The Commodore key is the key in the lower left corner of the keyboard.) Again, if the key is preceded by a number, you should press the key as many times as necessary.

Rarely, you'll see a solitary letter of the alphabet enclosed in braces. These characters can be entered on the Commodore 64 by holding down the CTRL key while typing the letter in the braces. For example, {A} would indicate that you should press CTRL-A. You should never have to enter such a character on the VIC-20, but if you do, you would have to leave the quote mode (press RETURN and cursor back up to the position where the control character should go), press CTRL-9 (RVS ON), the letter in braces, and then CTRL-0 (RVS OFF).

About the *quote mode*: You know that you can move the cursor around the screen with the CRSR keys. Sometimes a programmer will want to move the cursor under program control. That's why you see all the {LEFT}'s, {HOME}'s, and {BLU}'s in our programs. The only way the computer can tell the difference between direct and programmed cursor control is the quote mode.

Once you press the quote (the double quote, SHIFT-2), you are in the quote mode. If you type something and then try to change it by moving the cursor left, you'll only get a bunch of reverse-video lines. These are the symbols for cursor left. The only editing key that isn't programmable is the DEL key; you can still use DEL to back up and edit the line. Once you type another quote, you are out of quote mode.

You also go into quote mode when you INSerT spaces into a line. In any case, the easiest way to get out of quote mode is to just press RETURN. You'll then be out of quote mode and you can cursor up to the mistyped line and fix it.

Use the following table when entering cursor and color control keys:

When You Read:	Press:	See:	When You Read:	Press:	See:	When You Read:	Press:	See:
{CLR}	SHIFT + CLR HOME		{CYN}	CTRL + 4		{F1}	f1	
{HOME}	CLR HOME		{PUR}	CTRL + 5		{F2}	SHIFT + f1	
{UP}	SHIFT + ↑ CRSR		{GRN}	CTRL + 6		{F3}	f3	
{DOWN}	↓ CRSR		{BLU}	CTRL + 7		{F4}	SHIFT + f3	
{LEFT}	SHIFT + ← CRSR		{YEL}	CTRL + 8		{F5}	f5	
{RIGHT}	→ CRSR		{1}	C= + 1		{F6}	SHIFT + f5	
{RVS}	CTRL + 9		{2}	C= + 2		{F7}	f7	
{OFF}	CTRL + 0		{3}	C= + 3		{F8}	SHIFT + f7	
{BLK}	CTRL + 1		{4}	C= + 4				
{WHT}	CTRL + 2		{5}	C= + 5				
{RED}	CTRL + 3		{6}	C= + 6				
						{7}	C= + 7	
						{8}	C= + 8	

The Automatic Proofreader

"The Automatic Proofreader" will help you type in program listings from COMPUTE!'s Gazette without typing mistakes. It is a short error-checking program that hides itself in memory. When activated, it lets you know immediately after typing a line from a program listing if you have made a mistake. Please read these instructions carefully before typing any programs in COMPUTE!'s Gazette.

Preparing The Proofreader

1. Using the listing below, type in the Proofreader. The same program works on both the VIC-20 and Commodore 64. Be very careful when entering the DATA statements — don't type an l instead of a 1, an O instead of a 0, extra commas, etc.

2. SAVE the Proofreader on tape or disk at least twice *before running it for the first time.* This is very important because the Proofreader erases this part of itself when you first type RUN.

3. After the Proofreader is SAVEd, type RUN. It will check itself for typing errors in the DATA statements and warn you if there's a mistake. Correct any errors and SAVE the corrected version. Keep a copy in a safe place — you'll need it again and again, every time you enter a program from COMPUTE!'s Gazette.

4. When a correct version of the Proofreader is RUN, it activates itself. You are now ready to enter a program listing. If you press RUN/STOP-RESTORE, the Proofreader is disabled. To reactivate it, just type the command SYS 886 and press RETURN.

Using The Proofreader

All VIC and 64 listings in COMPUTE!'s Gazette now have a checksum number appended to the end of each line, for example "rem 123". *Don't enter this statement when typing in a program.* It is just for your information. The rem makes the number harmless if someone does type it in. It will, however, use up memory if you enter it, and it will confuse the Proofreader, even if you entered the rest of the line correctly.

When you type in a line from a program listing and press RETURN, the Proofreader displays a number at the top of your screen. *This checksum number must match the checksum number in the printed listing.* If it doesn't, it means you typed the line differently than the way it is listed. Immediately recheck your typing. Remember, don't type the rem statement with the checksum number; it is published only so you can check it against the number which appears on your screen.

The Proofreader is not picky with spaces. It will not notice extra spaces or missing ones. This is for your convenience, since spacing is generally not important. But occasionally proper spacing *is* important, so be extra careful with spaces, since the Proofreader will catch practically everything else that can go wrong.

There's another thing to watch out for: if you enter the line by using abbreviations for commands, the checksum will not match up. But there is a way to make the Proofreader check it. After entering the line, LIST it. This eliminates the abbreviations. Then move the cursor up to the line and press RETURN. It should now match the checksum. You can check whole groups of lines this way.

Special Tape SAVE Instructions

When you're done typing a listing, you must disable the Proofreader before SAVEing the program on tape. Disable the Proofreader by pressing RUN/STOP-RESTORE (hold down the RUN/STOP key and sharply hit the RESTORE key). This procedure is not necessary for disk SAVEs, *but you must disable the Proofreader this way before a tape SAVE.*

SAVE to tape erases the Proofreader from memory, so you'll have to LOAD and RUN it again if you want to type another listing. SAVE to disk does not erase the Proofreader.

Since the Proofreader is a machine language program stored in the cassette buffer, it will be erased during a tape SAVE or LOAD. If you intend to type in a program in more than one sitting or wish to make a safety SAVE, follow this procedure:

1. LOAD and RUN the Proofreader.
2. Disable it by pressing RUN/STOP–RESTORE.
3. Type the following three lines in direct mode (without line numbers):

```
A$="PROOFREADER.T":B$="{10 SPACES}":FO
RX=1TO4:A$=A$+B$:NEXTX
FORX=886 TO 1018:A$=A$+CHR$(PEEK(X)):N
EXTX
OPEN1,1,1,A$:CLOSE1
```

After you type the last line, you will be asked to press RECORD and PLAY. We recommend you start at the beginning of a new tape.

You now have a new version of the Proofreader (PROOFREADER.T, as renamed in the above code). Turn your computer off and on, then LOAD the program you were working on. Put the cassette containing PROOFREADER.T into the tape unit and type:

OPEN1:CLOSE1

You can now get into the Proofreader by typing SYS 886. To test this, PRINT PEEK (886) should return the number 173. If it does not, repeat the steps above, making sure that A$ (PROOFREADER.T) contains 13 characters and that B$ contains 10 spaces.

The new version of Automatic Proofreader will load itself into the cassette buffer whenever you type OPEN1:CLOSE1 and PROOFREADER.T is the next program on your tape. It will not disturb the contents of BASIC memory.

Automatic Proofreader For VIC And 64

```
100 PRINT"{CLR}PLEASE WAIT...":FORI=886TO
    1018:READA:CK=CK+A:POKEI,A:NEXT
110 IF CK<>17539 THEN PRINT"{DOWN}YOU MAD
    E AN ERROR":PRINT"IN DATA STATEMENTS.
    ":END
120 SYS886:PRINT"{CLR}{2 DOWN}PROOFREADER
     ACTIVATED.":NEW
886 DATA 173,036,003,201,150,208
892 DATA 001,096,141,151,003,173
898 DATA 037,003,141,152,003,169
904 DATA 150,141,036,003,169,003
910 DATA 141,037,003,169,000,133
916 DATA 254,096,032,087,241,133
922 DATA 251,134,252,132,253,008
928 DATA 201,013,240,017,201,032
934 DATA 240,005,024,101,254,133
940 DATA 254,165,251,166,252,164
946 DATA 253,040,096,169,013,032
952 DATA 210,255,165,214,141,251
958 DATA 003,200,251,096,169,000
964 DATA 133,216,169,019,032,210
970 DATA 255,169,018,032,210,255
976 DATA 169,058,032,210,255,166
982 DATA 254,169,000,133,254,172
988 DATA 151,003,192,087,208,006
994 DATA 032,205,189,076,235,003
1000 DATA 032,205,221,169,032,032
1006 DATA 210,255,032,210,255,173
1012 DATA 251,003,133,214,076,173
1018 DATA 003
```

MLX Machine Language Entry Program

For Commodore 64

Charles Brannon, Program Editor

MLX is a labor-saving utility that allows almost fail-safe entry of machine language programs published in COMPUTE!. You need to know nothing about machine language to use MLX—it was designed for everyone.

MLX is a new way to enter long machine language (ML) programs with a minimum of fuss. MLX lets you enter the numbers from a special list that looks similar to BASIC DATA statements. It checks your typing on a line-by-line basis. It won't let you enter illegal characters when you should be typing numbers. It won't let you enter numbers greater than 255 (forbidden in ML). It won't let you enter the wrong numbers on the wrong line. In addition, MLX creates a ready-to-use tape or disk file. You can then use the LOAD command to read the program into the computer, as with any program:

LOAD "filename",1,1 (for tape)
LOAD "filename",8,1 (for disk)

To start the program, you enter a SYS command that transfers control from BASIC to machine language. The starting SYS number always appears in the appropriate article.

Using MLX

Type in and save MLX (you'll want to use it in the future). When you're ready to type in an ML program, run MLX. MLX asks you for two numbers: the starting address and the ending address. These numbers are given in the article accompanying the ML program.

You'll see a prompt corresponding to the starting address. The prompt is the current line you are entering from the listing. It increases by six each time you enter a line. That's because each line has seven numbers—six actual data numbers plus a *checksum number*. The checksum verifies that you typed the previous six numbers correctly. If you enter any of the six numbers wrong, or enter the checksum wrong, the computer rings a buzzer and prompts you to reenter the line. If you enter it correctly, a bell tone sounds and you continue to the next line.

MLX accepts only numbers as input. If you make a typing error, press the INST/DEL key; the entire number is deleted. You can press it as many times as necessary back to the start of the line. If you enter three-digit numbers as listed, the computer automatically prints the comma and goes on to accept the next number. If you enter less than three digits, you can press either the SPACE bar or RETURN key to advance to the next number. The checksum automatically appears in inverse video for emphasis.

To simplify your typing, MLX redefines part of the keyboard as a numeric keypad:

```
  U I O          become    7 8 9
H J K L                    4 5 6
  M , .                    1 2 3
```

MLX Commands

When you finish typing an ML listing (assuming you type it all in one session) you can then save the completed program on tape or disk. Follow the screen instructions. If you get any errors while saving, you probably have a bad disk, or the disk is full, or you've made a typo when entering the MLX program itself.

You don't have to enter the whole ML program in one sitting. MLX lets you enter as much as you want, save it, and then reload the file from tape or disk later.

MLX recognizes these commands:

SHIFT-S: Save **SHIFT-N: New Address**
SHIFT-S: Load **SHIFT-D: Display**

When you enter a command, MLX jumps out of the line you've been typing, so we recommend you do it at a new prompt. Use the Save command to save what you've been working on. It will save on tape or disk, as if you've finished, but the tape or disk won't work, of course, until you finish the typing. Remember what address you stop at. The next time you run MLX, answer all the prompts as you did before, then insert the disk or tape. When you get to the entry prompt, press SHIFT-L to reload the partly completed file into memory. Then use the New Address command to resume typing.

To use the New Address command, press SHIFT-N and enter the address where you previously stopped. The prompt will change, and you can then continue typing. Always enter a New Address that matches up with one of the line numbers in the special listing, or else the checksum won't work. The Display command lets you display a section of your typing. After you press SHIFT-D, enter two addresses within the line number range of the listing. You can abort the listing by pressing any key.

What if you forgot where you stopped typing? Use the Display command to scan memory from the beginning to the end of the program. When you reach the end of your typing, the lines will contain a random pattern of numbers. When you see the end of your typing, press any key to stop the listing. Use the New Address command to continue typing from the proper location.

See program listing on page 186.

Bug-Swatter:
Modifications And Corrections

• "Vocab Builder" (October) was written to run on both a VIC and 64, with either a disk or tape drive. Several tape users have written to say the program does not save or load test items.

There are two places in the program where the disk error channel is checked. When the program was tested, it worked with tape, but only because a disk drive was also connected to the computer. If you own a Datassette, but not a disk drive, delete lines 572, 575, 902, and 905. Then change the following lines:

```
570 OPEN1,1,1,N$
900 OPEN1,1,0,N$
```

• Both VIC and 64 versions of "Beekeeper" (July) work as listed, but they suffer from a subtle programming error. Reader Bob Lynch became proficient enough to reach the nineteenth level (a feat unmatched by our testers) and got an OUT OF MEMORY error.

This condition can be traced to line 410, where the swarm level is updated. A GOTO jumps out of the subroutine in lines 300–480. The GOSUBs build up on the stack until level 19, where the computer thinks it is nineteen subroutines into the program. The stack fills up and the game stops. If you think you can reach level 19, make the following changes (both versions).

First, at the end of line 410, change GOTO45 to RETURN. Then, LIST lines 150 and 210, add a colon and the following line (immediately after the GOSUB):

```
ON((I=4001)+2)GOTO45,xxx
```

In place of *xxx* put the next line (160 or 220). Finally, LIST lines 100 and 270. In line 100, eliminate the GOTO after the GOSUB, add the ON-GOTO line above, with the number 120 in lieu of *xxx*. In line 270, delete GOTO50, add the ON-GOTO after the GOSUB, with the number 50 instead of *xxx*. These changes will allow you to go beyond swarm 19.

• The 64 version of "The Tomb" (October) works as listed, except the high score remains at zero. Line 4010 is the culprit, and can be fixed by deleting the less than (<) character. The line should read IF SC>PH THEN PH=SC. Thanks to Reader Jim Willman for this correction.

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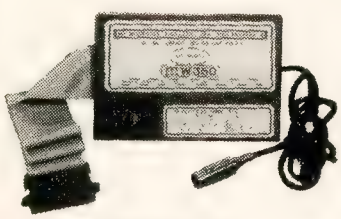

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(Article on page 118.)

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs," "A Beginner's Guide To Typing In Programs," and "The Automatic Proofreader" that appear before the Program Listings.

Requires MLX (see instructions in article).

Program 1: Tables Setup

```
2049 :011,008,010,000,158,050,238
2055 :048,054,049,000,000,000,158
2061 :024,169,170,105,022,133,124
2067 :253,169,008,105,053,133,228
2073 :254,162,000,142,102,008,181
2079 :169,170,133,251,169,008,163
2085 :133,252,169,000,168,145,136
2091 :251,230,251,166,251,224,136
2097 :000,208,002,230,252,166,139
2103 :251,228,253,208,235,166,116
2109 :252,228,253,208,229,169,120
2115 :001,162,008,160,001,032,175
2121 :186,255,169,006,162,103,186
2127 :160,008,032,189,255,169,124
2133 :109,133,251,169,008,133,120
2139 :252,166,253,164,254,169,069
2145 :251,032,216,255,000,000,083
2151 :084,065,066,076,069,083,034
2157 :001,008,049,058,085,080,134
2163 :048,049,044,080,044,087,211
2169 :000,104,002,104,000,115,190
2175 :001,115,255,255,001,000,242
2181 :001,000,001,000,002,000,137
2187 :000,121,002,121,000,133,004
2193 :001,133,000,139,003,139,048
2199 :001,000,000,001,000,000,153
2205 :049,000,000,000,000,000,206
2211 :048,000,000,000,000,000,211
2217 :049,000,013,013,013,013,014
```

Program 2: C/G Bulletin Board, Part 1

Note: See article before typing in. Part 2 will be published next month.

```
2049 :011,008,010,000,158,050,238
2055 :048,054,049,000,000,000,158
2061 :120,169,064,141,020,003,018
2067 :169,015,141,021,003,088,200
2073 :165,001,041,254,133,001,108
2079 :169,147,032,210,255,169,245
2085 :013,032,210,255,169,006,210
2091 :141,032,208,169,001,141,223
2097 :033,208,162,058,141,003,142
2103 :065,173,024,208,009,002,024
2109 :141,024,208,032,202,020,176
2115 :169,006,141,147,002,032,052
2121 :078,008,076,115,008,162,008
2127 :000,142,161,069,162,162,007
2133 :134,251,162,069,134,252,063
2139 :172,161,069,169,000,145,039
2145 :251,032,130,038,174,161,115
2151 :069,224,060,208,239,166,045
2157 :252,224,087,144,233,096,121
2163 :032,091,038,169,032,141,106
2169 :043,025,169,069,141,044,100
2175 :025,032,034,025,032,004,023
2181 :038,162,000,142,014,071,048
2187 :032,076,038,032,176,025,006
2193 :173,242,071,201,020,208,036
2199 :019,174,014,071,224,000,141
2205 :240,236,206,014,071,173,073
2211 :242,071,032,210,255,076,025
2217 :139,008,201,013,240,009,011
2223 :141,012,071,032,210,255,128
2229 :076,139,008,032,210,255,133
2235 :032,174,045,174,237,071,152
2241 :224,000,208,174,173,012,216
2247 :071,201,049,208,008,162,130
2253 :000,142,005,070,076,008,250
2259 :009,162,001,142,005,070,088
2265 :173,012,071,201,050,208,164
2271 :024,162,009,142,160,069,021
2277 :162,048,142,013,065,142,033
2283 :194,067,142,226,067,162,069
2289 :001,142,252,069,076,008,021
2295 :009,173,012,071,201,051,252
2301 :240,009,032,240,037,032,075
2307 :048,046,076,115,008,032,072
2313 :095,024,032,157,045,032,138
2319 :204,255,169,003,162,008,048
2325 :160,000,032,186,255,169,055
2331 :006,162,103,160,067,032,045
2337 :189,255,169,000,162,176,216
2343 :160,103,032,213,255,162,196
2349 :000,142,161,069,032,204,141
2355 :255,032,048,046,076,099,095
2361 :017,162,000,142,023,071,216
2367 :032,048,046,032,091,038,094
2373 :169,137,141,043,025,169,241
2379 :066,141,044,025,032,034,161
2385 :025,032,204,045,174,237,030
2391 :071,224,000,208,097,162,081
2397 :001,142,249,071,169,167,124
2403 :141,043,025,169,066,141,172
2409 :044,025,032,034,025,032,041
2415 :076,038,032,176,025,173,119
2421 :242,071,201,049,208,003,123
2427 :076,186,015,201,050,208,091
2433 :184,169,019,141,102,072,048
2439 :032,112,030,169,049,141,156
2445 :016,071,169,048,141,017,091
2451 :071,141,018,071,141,019,096
2457 :071,162,002,142,014,071,103
2463 :174,014,071,189,094,068,001
2469 :158,019,072,238,014,071,225
2475 :174,014,071,224,007,144,037
2481 :237,174,014,071,169,027,101
2487 :157,019,072,076,248,011,254
2493 :162,000,142,249,071,032,077
2499 :112,030,169,000,141,213,092
2505 :064,141,214,064,141,102,159
2511 :072,169,002,162,002,160,006
2517 :255,032,186,255,169,001,087
2523 :162,147,160,002,032,189,143
2529 :255,032,192,255,032,102,069
2535 :027,162,000,142,102,072,224
2541 :142,003,070,169,032,141,026
2547 :003,221,169,000,141,001,010
```

```
2553 :221,173,001,221,041,008,146
2559 :201,000,208,247,169,032,088
2565 :141,001,221,173,003,221,253
2571 :041,251,141,003,221,173,073
2577 :001,221,041,016,201,000,241
2583 :208,239,032,204,255,162,099
2589 :002,032,198,255,032,207,243
2595 :255,201,019,208,006,141,097
2601 :102,072,076,053,010,201,043
2607 :022,208,003,141,102,072,083
2613 :032,204,255,162,002,032,228
2619 :201,255,169,002,032,210,160
2625 :255,032,210,255,174,102,069
2631 :072,224,000,240,205,162,206
2637 :000,142,003,070,032,091,159
2643 :038,160,000,132,251,132,028
2649 :252,132,253,140,150,072,064
2655 :142,060,087,132,254,032,034
2661 :064,038,162,001,142,023,019
2667 :071,162,000,138,142,178,030
2673 :002,174,178,002,157,016,130
2679 :071,157,001,072,238,178,068
2685 :002,174,178,002,224,006,199
2691 :208,237,032,112,030,169,151
2697 :174,141,043,025,169,061,238
2703 :141,044,025,032,034,025,188
2709 :032,234,020,032,091,038,084
2715 :162,000,142,014,071,032,064
2721 :102,025,032,076,038,032,210
2727 :176,025,173,242,071,201,031
2733 :020,240,066,201,013,240,185
2739 :027,174,014,071,157,016,126
2745 :071,032,189,022,238,014,239
2751 :071,174,014,071,224,005,238
2757 :144,223,162,000,142,020,120
2763 :071,076,233,010,174,014,013
2769 :071,224,000,208,003,076,023
2775 :203,025,173,016,071,201,136
2781 :049,208,009,032,091,038,136
2787 :032,095,024,076,002,011,211
2793 :238,150,072,032,240,037,234
2799 :076,149,010,174,014,071,221
2805 :224,000,240,173,206,014,078
2811 :071,032,189,022,076,166,039
2817 :010,162,000,142,178,002,239
2823 :174,178,002,189,016,071,125
2829 :201,000,240,009,157,001,109
2835 :072,238,178,002,076,007,080
2841 :011,032,213,029,174,213,185
2847 :064,224,000,208,010,174,199
2853 :214,064,224,000,208,003,238
2859 :076,233,010,032,124,030,036
2865 :032,120,029,169,001,032,176
2871 :195,255,174,250,071,224,200
2877 :000,240,019,162,042,142,154
2883 :014,071,024,162,084,142,052
2889 :015,071,162,000,142,161,112
2895 :069,076,096,011,162,000,237
2901 :142,014,071,142,161,069,172
2907 :162,042,142,015,071,174,185
2913 :014,071,172,161,069,189,005
2919 :164,069,153,006,072,238,037
2925 :014,071,238,161,069,174,068
2931 :014,071,236,015,071,208,218
2937 :230,162,000,142,150,072,109
2943 :174,249,071,224,000,240,061
2949 :001,096,174,047,072,224,235
2955 :000,240,016,169,192,141,129
2961 :043,025,169,065,141,044,120
2967 :025,032,034,025,076,232,063
2973 :009,032,091,038,032,048,151
2979 :046,032,234,020,032,235,250
2985 :023,174,090,072,224,000,240
2991 :208,045,032,119,025,173,009
2997 :090,072,201,000,208,035,019
3003 :162,000,142,150,072,032,233
3009 :062,023,032,117,023,032,226
3015 :204,255,162,004,032,201,033
3021 :255,169,013,032,210,255,115
3027 :032,204,255,169,004,032,139
3033 :195,255,076,228,011,032,246
3039 :198,023,076,158,011,032,209
3045 :188,020,174,249,071,224,131
3051 :000,208,010,174,003,070,188
3057 :224,001,208,003,076,093,078
3063 :013,032,188,028,032,091,119
3069 :038,174,002,070,224,000,249
3075 :240,003,032,220,020,174,180
3081 :001,070,224,001,208,003,004
3087 :076,252,020,174,248,071,088
3093 :224,001,208,055,032,091,120
3099 :038,162,000,142,212,080,149
3105 :162,000,236,023,071,240,253
3111 :010,162,000,142,023,071,191
3117 :162,001,142,212,080,169,043
3123 :144,141,043,025,169,068,129
3129 :141,044,025,032,034,025,102
3135 :174,212,080,224,001,208,194
3141 :010,162,000,142,212,080,163
3147 :162,001,142,023,071,032,250
3153 :162,025,169,032,141,242,084
3159 :071,032,189,022,032,004,181
3165 :038,032,176,025,173,242,011
3171 :071,141,243,071,032,189,078
3177 :022,169,013,141,242,071,251
3183 :032,189,022,162,000,142,146
3189 :239,080,173,243,071,201,100
3195 :049,208,003,076,146,030,123
3201 :174,008,070,224,000,240,077
3207 :003,076,245,012,201,050,210
3213 :208,003,076,115,046,174,251
3219 :005,070,224,000,240,092,010
3225 :201,051,208,018,162,001,026
3231 :142,239,080,174,252,069,091
3237 :224,001,208,003,032,174,039
3243 :020,076,237,057,201,052,046
3249 :208,018,162,001,142,239,179
3255 :080,174,252,069,224,001,215
3261 :208,003,032,174,020,076,190
3267 :115,046,201,053,208,020,070
3273 :174,249,071,224,000,208,103
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8685 :066,174,023,071,224,000,027
8691 :208,050,201,075,208,046,007
8697 :162,001,142,010,070,162,028
8703 :000,142,161,069,142,014,015
8709 :071,162,004,142,023,070,221
8715 :174,023,070,189,251,103,053
8721 :172,014,071,153,049,072,036
8727 :238,014,071,206,023,070,133
8733 :174,014,071,224,004,208,212
8739 :231,076,061,033,032,188,144
8745 :028,032,240,037,076,154,096
8751 :033,032,107,056,032,241,036
8757 :028,174,090,072,224,000,129
8763 :240,011,032,240,037,162,013
8769 :000,142,090,072,076,146,079
8775 :030,032,032,037,032,188,166
8781 :028,174,196,103,236,246,036
8787 :103,176,016,174,247,103,134
8793 :236,197,103,144,008,162,171
8799 :000,142,105,072,076,146,124
8805 :030,076,182,032,162,000,071
8811 :142,108,072,142,115,072,246
8817 :142,236,071,142,103,072,111
8823 :032,032,030,032,032,030,051
8829 :032,233,022,173,242,071,130
8835 :141,012,071,162,001,236,242
8841 :108,072,208,003,076,201,037
8847 :035,174,115,072,236,094,101
8853 :072,176,006,238,115,072,060
8859 :076,125,034,162,001,142,183
8865 :108,072,173,012,071,141,226
8871 :103,072,032,173,037,173,245
8877 :012,071,201,255,208,019,171
8883 :169,230,141,043,025,169,188
8889 :066,141,044,025,032,034,015
8895 :025,032,048,046,076,184,090
8901 :036,032,233,022,173,242,167
8907 :071,141,012,071,174,105,009
8913 :072,224,000,208,027,174,146
8919 :023,071,224,000,240,008,013
8925 :169,007,141,242,071,032,115
8931 :244,036,173,012,071,141,136
8937 :242,071,141,250,080,076,069
8943 :017,035,032,233,022,173,239
8949 :242,071,201,000,240,246,221
8955 :032,173,037,032,233,022,012
8961 :173,242,071,201,000,240,160
8967 :246,032,173,037,032,091,106
8973 :038,076,195,035,174,023,042
8979 :071,224,000,240,003,032,077
8985 :244,036,173,242,071,201,224
8991 :048,208,014,173,024,208,194
8997 :041,253,141,024,208,032,224
9003 :173,037,076,059,035,173,084
9009 :024,208,009,002,141,024,201
9015 :208,032,173,037,032,233,002
9021 :022,173,242,071,174,102,077
9027 :072,224,022,208,017,173,015
9033 :242,071,041,015,201,008,139
9039 :176,003,076,089,035,169,115
9045 :049,141,242,071,174,023,017
9051 :071,224,000,240,006,173,037
9057 :242,071,032,244,036,173,127
9063 :242,071,041,015,141,032,133
9069 :208,032,173,037,032,233,056
9075 :022,173,242,071,201,000,056
9081 :240,246,174,102,072,224,155
9087 :022,208,017,173,242,071,092
9093 :041,015,201,008,176,003,065
9099 :076,147,035,169,049,141,244
9105 :242,071,174,023,071,224,182
9111 :000,240,006,173,242,071,115
9117 :032,244,036,173,242,071,187
9123 :041,015,141,033,208,032,121
9129 :173,037,173,250,080,201,059
9135 :048,208,017,173,103,072,028
9141 :201,019,208,010,173,102,126
9147 :072,201,022,208,003,076,001
9153 :193,036,032,013,038,076,069
9159 :125,034,173,242,071,201,021
9165 :026,208,006,032,173,037,175
9171 :076,184,036,173,242,071,225
9177 :201,027,208,067,174,236,106
9183 :071,224,000,208,017,032,007
9189 :048,046,032,030,038,162,073
9195 :001,142,236,071,032,173,122
9201 :037,076,125,034,032,048,081
9207 :046,174,236,071,224,001,231
9213 :240,021,162,000,142,236,030
9219 :071,032,173,037,174,105,083
9225 :072,224,000,208,003,076,080
9231 :125,034,076,184,036,032,246
9237 :047,038,238,236,071,032,171
9243 :173,037,076,125,034,162,122
9249 :000,142,000,070,173,242,148
9255 :071,201,018,208,008,162,195
9261 :001,142,255,069,076,169,245
9267 :036,201,146,208,008,162,044
```

```
9273 :000,142,255,069,076,169,000
9279 :036,173,242,071,201,013,031
9285 :208,036,174,255,069,224,011
9291 :000,240,021,169,146,141,024
9297 :242,071,032,189,022,169,038
9303 :013,141,242,071,032,189,007
9309 :022,169,018,141,242,071,244
9315 :162,000,142,000,070,076,037
9321 :169,036,174,102,072,224,114
9327 :022,208,035,173,242,071,094
9333 :201,022,208,008,169,000,213
9339 :141,242,071,076,169,036,090
9345 :201,129,240,008,201,149,033
9351 :144,032,201,156,176,028,104
9357 :169,144,141,242,071,076,216
9363 :169,036,173,242,071,201,015
9369 :022,208,013,169,013,141,207
9375 :242,071,162,001,142,000,009
9381 :070,076,071,036,173,242,065
9387 :071,141,012,071,032,189,175
9393 :022,032,173,037,076,125,130
9399 :034,032,204,255,169,001,110
9405 :032,195,255,096,169,039,207
9411 :141,043,025,169,065,141,011
9417 :044,025,032,034,025,032,137
9423 :204,045,174,237,071,224,138
9429 :001,208,011,165,078,141,049
9435 :242,071,032,189,022,076,083
9441 :184,036,165,089,141,242,058
9447 :071,032,189,022,173,012,218
9453 :071,141,242,071,076,195,009
9459 :035,032,204,255,174,023,198
9465 :071,224,000,208,009,173,166
9471 :242,071,032,210,255,076,117
9477 :028,037,162,002,032,201,211
9483 :255,173,242,071,032,210,226
9489 :255,032,204,029,174,088,031
9495 :072,224,000,208,216,032,007
9501 :204,255,096,238,246,103,147
9507 :174,246,103,224,000,208,222
9513 :003,238,247,103,096,169,129
9519 :000,141,015,071,174,015,207
9525 :071,157,019,072,238,015,113
9531 :071,174,015,071,224,026,128
9537 :144,240,096,032,046,037,148
9543 :169,212,141,043,025,169,062
9549 :065,141,044,025,032,034,162
9555 :025,032,004,038,162,000,088
9561 :142,015,071,032,016,023,132
9567 :173,242,071,201,013,208,235
9573 :008,169,027,141,242,071,247
9579 :076,138,037,201,020,208,019
9585 :024,174,015,071,224,000,109
9591 :240,227,032,189,022,206,011
9597 :015,071,174,015,071,169,128
9603 :000,157,019,072,076,092,035
9609 :037,032,189,022,174,015,094
9615 :071,173,242,071,157,019,108
9621 :072,201,027,240,013,238,172
9627 :015,071,174,015,071,224,213
9633 :026,176,003,076,092,037,059
9639 :162,001,142,004,070,096,130
9645 :238,094,072,174,094,072,149
9651 :224,253,208,056,162,000,058
9657 :142,094,072,032,204,255,216
9663 :238,213,064,174,213,064,133
9669 :224,000,208,003,238,214,060
9675 :064,174,214,064,224,001,176
9681 :208,017,174,213,064,224,085
9687 :145,144,010,162,001,142,051
9693 :213,064,162,000,142,214,248
9699 :064,032,032,030,032,032,193
9705 :030,162,001,032,198,255,143
9711 :096,032,048,046,169,204,066
9717 :141,043,025,169,064,141,060
9723 :044,025,032,034,025,032,187
9729 :218,023,096,169,062,141,198
9735 :242,071,032,189,022,096,147
9741 :032,091,038,169,020,141,248
9747 :043,025,169,065,141,044,250
9753 :025,032,034,025,096,032,013
```

MLX

(Article on page 175.)

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs," "A Beginner's Guide To Typing In Programs," and "The Automatic Proofreader" that appear before the Program Listings.

MLX—64 Version

```
10 REM LINES CHANGED FROM MLX VERSION 2.0
   0 ARE 750,765,770 AND 860        :rem 50
20 REM LINE CHANGED FROM MLX VERSION 2.01
   IS 300                           :rem 147
100 PRINT"{CLR}{6}";CHR$(142);CHR$(8);:PO
   KE53281,1:POKE53280,1            :rem 67
101 POKE 788,52:REM DISABLE RUN/STOP
                                    :rem 119
110 PRINT"{RVS}{39 SPACES}";        :rem 176
120 PRINT"{RVS}{14 SPACES}{RIGHT}{OFF}{*}
   £{RVS}{RIGHT} {RIGHT}{2 SPACES}{*}
   {OFF}{*}£{RVS}£{RVS}{14 SPACES}";
                                    :rem 250
130 PRINT"{RVS}{14 SPACES}{RIGHT} {G}
   {RIGHT} {2 RIGHT} {OFF}£{RVS}£{*}
   {OFF}{*}{RVS}{14 SPACES}";       :rem 35
140 PRINT"{RVS}{41 SPACES}"         :rem 120
200 PRINT"{2 DOWN}{PUR}{BLK} MACHINE LANG
   UAGE EDITOR VERSION 2.02{5 DOWN}"
                                    :rem 238
210 PRINT"{5}{2 UP}STARTING ADDRESS?
   {8 SPACES}{9 LEFT}";             :rem 143
215 INPUTS:F=1-F:C$=CHR$(31+119*F)
                                    :rem 166
220 IFS<256OR(S>40960ANDS<49152)ORS>53247
   THENGOSUB3000:GOTO210            :rem 235
225 PRINT:PRINT:PRINT               :rem 180
230 PRINT"{5}{2 UP}ENDING ADDRESS?
   {8 SPACES}{9 LEFT}";:INPUTE:F=1-F:C$=
   CHR$(31+119*F)                   :rem 20
240 IFE<256OR(E>40960ANDE<49152)ORE>53247
   THENGOSUB3000:GOTO230            :rem 183
250 IFE<STHENPRINTC$;"{RVS}ENDING < START
   {2 SPACES}":GOSUB1000:GOTO 230
                                    :rem 176
260 PRINT:PRINT:PRINT               :rem 179
300 PRINT"{CLR}";CHR$(14):AD=S      :rem 56
310 A=1:PRINTRIGHT$("0000"+MID$(STR$(AD),
   2),5);":";                       :rem 33
315 FORJ=ATO6                       :rem 33
320 GOSUB570:IFN=-1THENJ=J+N:GOTO320
                                    :rem 228
```

```
390 IFN=-211THEN 710                    :rem 62
400 IFN=-204THEN 790                    :rem 64
410 IFN=-206THENPRINT:INPUT"{DOWN}ENTER N
    EW ADDRESS";ZZ                      :rem 44
415 IFN=-206THENIFZZ<SORZZ>ETHENPRINT"
    {RVS}OUT OF RANGE":GOSUB1000:GOTO410
                                        :rem 225
417 IFN=-206THENAD=ZZ:PRINT:GOTO310
                                        :rem 238
420 IF N<>-196 THEN 480                 :rem 133
430 PRINT:INPUT"DISPLAY:FROM";F:PRINT,"TO
    ";:INPUTT                           :rem 234
440 IFF<SORF>EORT<SORT>ETHENPRINT"AT LEAS
    T";S;"{LEFT}, NOT MORE THAN";E:GOTO43
    0                                   :rem 159
450 FORI=FTOTSTEP6:PRINT:PRINTRIGHT$("000
    0"+MID$(STR$(I),2),5);":";          :rem 30
451 FORK=0TO5:N=PEEK(I+K):PRINTRIGHT$("00
    "+MID$(STR$(N),2),3);",";           :rem 66
460 GETA$:IFA$>""THENPRINT:PRINT:GOTO310
                                        :rem 25
470 NEXTK:PRINTCHR$(20);:NEXTI:PRINT:PRIN
    T:GOTO310                           :rem 50
480 IFN<0 THEN PRINT:GOTO310            :rem 168
490 A(J)=N:NEXTJ                        :rem 199
500 CKSUM=AD-INT(AD/256)*256:FORI=1TO6:CK
    SUM=(CKSUM+A(I))AND255:NEXT         :rem 200
510 PRINTCHR$(18);:GOSUB570:PRINTCHR$(146
    );                                  :rem 94
511 IFN=-1THENA=6:GOTO315               :rem 254
515 PRINTCHR$(20):IFN=CKSUMTHEN530
                                        :rem 122
520 PRINT:PRINT"LINE ENTERED WRONG : RE-E
    NTER":PRINT:GOSUB1000:GOTO310:rem 176
530 GOSUB2000                           :rem 218
540 FORI=1TO6:POKEAD+I-1,A(I):NEXT:POKE54
    272,0:POKE54273,0                   :rem 227
550 AD=AD+6:IF AD<E THEN 310            :rem 212
560 GOTO 710                            :rem 108
570 N=0:Z=0                             :rem 88
580 PRINT"[£3]";                        :rem 81
581 GETA$:IFA$=""THEN581                :rem 95
582 AV=-(A$="M")-2*(A$=",")-3*(A$=".")-4*
    (A$="J")-5*(A$="K")-6*(A$="L"):rem 41
583 AV=AV-7*(A$="U")-8*(A$="I")-9*(A$="O"
    ):IFA$="H"THENA$="0"                :rem 134
584 IFAV>0THENA$=CHR$(48+AV)            :rem 134
585 PRINTCHR$(20);:A=ASC(A$):IFA=13ORA=44
    ORA=32THEN670                       :rem 229
590 IFA>128THENN=-A:RETURN              :rem 137
600 IFA<>20 THEN 630                    :rem 10
610 GOSUB690:IFI=1ANDT=44THENN=-1:PRINT"
    {OFF}{LEFT} {LEFT}";:GOTO690        :rem 62
620 GOTO570                             :rem 109
630 IFA<48ORA>57THEN580                 :rem 105
640 PRINTA$;:N=N*10+A-48                :rem 106
650 IFN>255 THEN A=20:GOSUB1000:GOTO600
                                        :rem 229
660 Z=Z+1:IFZ<3THEN580                  :rem 71
670 IFZ=0THENGOSUB1000:GOTO570          :rem 114
680 PRINT",";:RETURN                    :rem 240
690 S%=PEEK(209)+256*PEEK(210)+PEEK(211)
                                        :rem 149
691 FORI=1TO3:T=PEEK(S%-I)              :rem 67
695 IFT<>44ANDT<>58THENPOKES%-I,32:NEXT
                                        :rem 205
700 PRINTLEFT$("{3 LEFT}",I-1);:RETURN
                                        :rem 7
710 PRINT"{CLR}{RVS}*** SAVE ***{3 DOWN}"
                                        :rem 236
715 PRINT"{2 DOWN}(PRESS {RVS}RETURN{OFF}
    ALONE TO CANCEL SAVE){DOWN}":rem 106
720 F$="":INPUT"{DOWN} FILENAME";F$:IFF$=
    ""THENPRINT:PRINT:GOTO310           :rem 71
730 PRINT:PRINT"{2 DOWN}{RVS}T{OFF}APE OR
    {RVS}D{OFF}ISK: (T/D)"              :rem 228
740 GETA$:IFA$<>"T"ANDA$<>"D"THEN740
                                        :rem 36
750 DV=1-7*(A$="D"):IFDV=8THENF$="0:"+F$:
    OPEN15,8,15,"S"+F$:CLOSE15          :rem 212
760 T$=F$:ZK=PEEK(53)+256*PEEK(54)-LEN(T$
    ):POKE782,ZK/256                    :rem 3
762 POKE781,ZK-PEEK(782)*256:POKE780,LEN(
    T$):SYS65469                        :rem 109
763 POKE780,1:POKE781,DV:POKE782,1:SYS654
    66                                  :rem 69
765 K=S:POKE254,K/256:POKE253,K-PEEK(254)
    *256:POKE780,253                    :rem 17
766 K=E+1:POKE782,K/256:POKE781,K-PEEK(78
    2)*256:SYS65496                     :rem 235
770 IF(PEEK(783)AND1)OR(191ANDST)THEN780
                                        :rem 111
775 PRINT"{DOWN}DONE.{DOWN}":GOTO310
                                        :rem 113
780 PRINT"{DOWN}ERROR ON SAVE.{2 SPACES}T
    RY AGAIN.":IFDV=1THEN720            :rem 171
781 OPEN15,8,15:INPUT#15,E1$,E2$:PRINTE1$
    ;E2$:CLOSE15:GOTO720                :rem 103
790 PRINT"{CLR}{RVS}*** LOAD ***{2 DOWN}"
                                        :rem 212
795 PRINT"{2 DOWN}(PRESS {RVS}RETURN{OFF}
    ALONE TO CANCEL LOAD)"              :rem 82
800 F$="":INPUT"{2 DOWN} FILENAME";F$:IFF
    $=""THENPRINT:GOTO310               :rem 144
810 PRINT:PRINT"{2 DOWN}{RVS}T{OFF}APE OR
    {RVS}D{OFF}ISK: (T/D)"              :rem 227
820 GETA$:IFA$<>"T"ANDA$<>"D"THEN820
                                        :rem 34
830 DV=1-7*(A$="D"):IFDV=8THENF$="0:"+F$
                                        :rem 157
840 T$=F$:ZK=PEEK(53)+256*PEEK(54)-LEN(T$
    ):POKE782,ZK/256                    :rem 2
841 POKE781,ZK-PEEK(782)*256:POKE780,LEN(
    T$):SYS65469                        :rem 107
845 POKE780,1:POKE781,DV:POKE782,1:SYS654
    66                                  :rem 70
850 POKE780,0:SYS65493                  :rem 11
860 IF(PEEK(783)AND1)OR(191ANDST)THEN870
                                        :rem 111
865 PRINT"{DOWN}DONE.":GOTO310          :rem 96
870 PRINT"{DOWN}ERROR ON LOAD.{2 SPACES}T
    RY AGAIN.{DOWN}":IFDV=1THEN800
                                        :rem 172
880 OPEN15,8,15:INPUT#15,E1$,E2$:PRINTE1$
    ;E2$:CLOSE15:GOTO800                :rem 102
1000 REM BUZZER                         :rem 135
1001 POKE54296,15:POKE54277,45:POKE54278,
     165                                :rem 207
1002 POKE54276,33:POKE 54273,6:POKE54272,
     5                                  :rem 42
1003 FORT=1TO200:NEXT:POKE54276,32:POKE54
     273,0:POKE54272,0:RETURN           :rem 202
2000 REM BELL SOUND                     :rem 78
2001 POKE54296,15:POKE54277,0:POKE54278,2
     47                                 :rem 152
2002 POKE 54276,17:POKE54273,40:POKE54272
     ,0                                 :rem 86
2003 FORT=1TO100:NEXT:POKE54276,16:RETURN
                                        :rem 57
3000 PRINTC$;"{RVS}NOT ZERO PAGE OR ROM":
     GOTO1000                           :rem 89
```

Cosmic Combat

(Article on page 92.)

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs," "A Beginner's Guide To Typing In Programs," and "The Automatic Proofreader" that appear before the Program Listings.

Program 1:

Cosmic Combat—VIC Loader

```
1 POKE36879,105:POKE56,28:POKE52,28:PRINT
  "{CLR}{WHT}"                          :rem 166
2 FORT=7168TO7271:READN:POKET,N:NEXT
                                        :rem 72
3 FORT=7424TO7431:POKET,0:NEXT          :rem 128
4 DATA24,24,24,24,189,255,255,129,129,153
  ,189,231,255,189,153,129              :rem 208
5 DATA0,238,136,232,40,238,0,255        :rem 78
6 DATA0,238,170,174,172,234,0,255,0,228,1
  30,239,130,228,0,224                  :rem 218
7 DATA0,234,138,238,42,234,0,255,0,187,17
  0,187,160,163,0,255                   :rem 183
8 DATA0,136,4,190,132,136,0,128,8,8,8,8,8
  ,8,8,8                                :rem 57
9 DATA128,64,32,16,8,4,2,1,1,2,4,8,16,32,
  64,128                                :rem 39
10 DATA0,0,0,255,0,0,0,0,0,255,0,255,0,25
   5,0,255,0                            :rem 135
11 DATA127,99,99,99,103,103,103,127,12,12
   ,12,12,28,28,28,28                   :rem 138
12 DATA127,3,3,127,96,96,96,127,126,6,6,1
   26,7,7,7,127                         :rem 111
13 DATA96,102,102,127,6,6,6,6,127,96,96,1
   27,3,3,3,127                         :rem 94
14 DATA127,96,96,127,99,99,99,127,127,3,3
   ,7,14,12,12,12                       :rem 218
15 DATA63,35,35,63,99,99,99,127,127,99,99
   ,127,3,3,3,127                       :rem 241
16 FORT=7551TO7631:READC:POKET,C:NEXT
                                        :rem 99
17 PRINT"{WHT} NOW LOADING PART II":FORT=
   1TO4:PRINT:NEXT                      :rem 243
19 S$="LO"+CHR$(34)+"CC"+CHR$(34)+",8:"+C
   HR$(131)                             :rem 89
20 REM CHANGE ,8 TO ,1 IN LINE 19 IF USIN
   G TAPE                               :rem 184
21 FORI=1TOLEN(S$):POKE630+I,ASC(MID$(S$,
   I)):NEXT:POKE198,I:END               :rem 90
```

Program 2:

Cosmic Combat—VIC Main Program

```
1 MT$="ATTACK FORCE":GOTO93             :rem 125
2 POKEZ+CL,.:POKEZ,32:Z=FNF(SL)+SK+Z:POKE
  Z+CL,2:POKEZ,1:RETURN                 :rem 33
3 POKECL+EL,2:POKEEL,1:POKECL+E1,2:POKEE1
  ,1:POKECL+ET,2:POKEET,1:POKEL+CL,5:POKE
  L,.                                   :rem 237
4 RETURN                                :rem 20
5 M=CL+T:POKEM-23,7:POKET-23,9:POKEM+23,7
  :POKET+23,9:POKEM-21,7:POKET-21,10
                                        :rem 10
6 POKEM+21,7:POKET+21,10:POKEM-22,7:POKET
  -22,8:POKEM+22,7:POKET+22,8:RETURN
                                        :rem 73
7 DIMJS(2,2):POKE37139,0:DD=37154:PA=3713
  7:PB=37152:CL=30720:FQ=36877:CM=36869:S
  B=36879                               :rem 201
8 FORI=0TO2:FORJ=0TO2:READJS(J,I):NEXTJ,I
  :DATA-1,0,1,-1,0,1,-1,0,1             :rem 131
9 POKECM,255:POKEDD,127:POKESB,8:S1=36876
  :V=36878:S2=36874                     :rem 199
10 DEFFNF(T)=INT(RND(1)*T)+1:DEFFNK(T)=PE
   EK(EL)+PEEK(ET)+PEEK(E1)             :rem 138
11 DEFFNX(T)=((PAND16)=T)-((PEEK(PB)AND12
   8)=.):DEFFNY(T)=-((PAND32)=T)        :rem 44
13 PRINT"{CLR}{2 RIGHT}BCD"SC"{HOME}"TAB(
   13)"EFG"2-DE:L=8130:K=L:C=L:POKECL+L,5
   :POKEL,.                             :rem 196
14 POKEV,15:FORT=1TO812:NEXT            :rem 22
15 EL=7728:POKECL+EL,2:POKEEL,1:E1=7734:P
   OKEE1+CL,2:POKEE1,1:ET=7741:POKECL+ET,
   2                                    :rem 103
16 POKEET,1:A=A+3                       :rem 227
17 P=PEEK(PA):X=FNX(.):FR=FNY(.):IFX=.GOT
   O23                                  :rem 219
19 K=K+X:IFK=8119ORK=8142GOTO23          :rem 122
21 L=L+X:POKEL+CL,5:POKEL,.:POKEC+CL,.:PO
   KEC,32:C=L                           :rem 157
23 K=L:POKES1,.:IFFR=.THENIFW=.GOTO29
                                        :rem 112
25 IFW=1THENPOKES1,.:FORT=FTOF-330STEP-22
   :POKET+CL,.:POKET,32:NEXT:W=.:GOTO29
                                        :rem 218
27 IFW=.THENF=L-22:POKES1,198:FORT=FTOF-3
   30STEP-22:POKET+CL,6:POKET,8:NEXT:W=1
                                        :rem 231
29 IFFNK(.)>3GOTO43                     :rem 105
31 IFQ=1GOTO39                          :rem 87
33 IFQ=2GOTO49                          :rem 91
35 Z=EL:GOSUB2:EL=Z:IFEL>8120THENED=EL:GO
   TO69                                 :rem 169
37 Q=1:GOTO17                           :rem 4
39 Z=E1:GOSUB2:E1=Z:IFE1>8120THENED=E1:GO
   TO69                                 :rem 65
41 Q=2:GOTO17                           :rem 0
43 IFPEEK(EL)>1THENED=EL:GOTO53         :rem 205
45 IFPEEK(E1)>1THENED=E1:GOTO53         :rem 153
47 IFPEEK(ET)>1THENED=ET:GOTO53         :rem 225
49 Z=ET:GOSUB2:ET=Z:IFET>8120THENED=ET:GO
   TO69                                 :rem 206
51 Q=.:GOTO17                           :rem 253
53 T=ED:POKET+CL,2:POKET,1:GOSUB5:POKECL+
   T-1,7:POKET-1,11:POKECL+T+1,7:POKET+1,
   11                                   :rem 30
55 FORT=250TO150STEP-3:POKES1,T:NEXT:POKE
   S1,.:IFXM=.THENIFSC>5000THENDE=DE-1:XM
   =1                                   :rem 212
57 SC=SC+100:HE=HE+100:IFHE>2000THENKK=KK
   +1:HE=.:GOSUB107                     :rem 172
59 A=A+1:IFA>24THENA=.:GOTO87           :rem 244
61 IFEL=EDTHENEL=FNF(7)+7727            :rem 174
63 IFE1=EDTHENE1=FNF(7)+7734            :rem 120
65 IFET=EDTHENET=FNF(14)+7727           :rem 240
67 PRINT"{CLR}{2 RIGHT}BCD"SC"{HOME}"TAB(
   13)"EFG"2-DE:GOSUB3:GOTO17           :rem 19
69 FORT=-3TO3:IFT+ED>8119ANDT+ED<8142THEN
   POKECL+T+ED,3:POKET+ED,12            :rem 100
71 NEXT:POKES1,.:IFSC>.THENSC=SC-20:HE=HE
   -20                                  :rem 0
73 POKEFQ,150:FORN=15TO3STEP-2:POKEV,N:FO
   RT=1TO99:NEXTT,N:POKEFQ,.:POKEV,15
                                        :rem 152
75 IFL>ED-4ANDL<ED+4GOTO79              :rem 91
77 GOTO61                               :rem 14
79 DE=DE+1:T=L:GOSUB5                   :rem 33
```

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81 POKES2,235:FORT=1TO863:NEXT:POKES2,228
   :FORT=1TO1245:NEXT                    :rem 4
83 POKES2,.:IFDE=3THENGOTO103            :rem 55
85 GOTO13                                :rem 10
87 AW=AW+1                               :rem 56
89 POKESB,105:PRINT"{CLR}":POKECM,240
                                         :rem 80
91 LG=LEN(STR$(AW))+LEN(MT$):GL=LG/2:PRIN
   T"{CLR}{9 DOWN}"TAB(11-GL)MT$AW
                                         :rem 108
92 FORT=1TO2687:NEXT:POKECM,255:POKESB,8:
   GOTO 13                               :rem 1
93 POKE36879,105:PRINT"{CLR}{WHT}"TAB(92)
   "COSMIC COMBAT"SPC(98)"SKILL LEVEL"SPC
   (34)"1-2-3-4-5"                       :rem 212
95 FORT=7724TO7742:POKET,32:POKET+88,32:P
   OKET+3,160:POKET+91,160:GETK$:IFK$<>""
   GOTO99                                :rem 133
97 NEXT:FORT=7745TO7727STEP-1:POKET,32:PO
   KET+88,32:POKET-3,160:POKET+85,160:NEX
   T:GOTO95                              :rem 213
99 KK=VAL(K$):IFKK=0ORKK>5THENNEXT
                                         :rem 204
101 GOSUB107:PRINT"{CLR}":GOTO7          :rem 242
103 POKEDD,255:FORT=1TO2647:NEXT:POKECM,2
    40:PRINT"{CLR}"SPC(94)"GAME OVER
                                         :rem 90
105 FORT=1TO2647:NEXT:CLR:GOTO93         :rem 40
107 IFKK<3THENSK=21-KK:SL=(KK*2)+1:rem 17
109 IFKK=3THENSK=42:SL=3                 :rem 232
111 IFKK=4THENSK=41:SL=5                 :rem 227
113 IFKK>4THENSK=64:SL=3                 :rem 233
115 RETURN                               :rem 119
```

Program 3:

Cosmic Combat—64 Version

Requires MLX (see instructions in article).

```
49152 :076,086,196,000,015,015,132
49158 :001,000,000,000,000,000,007
49164 :000,004,000,001,024,060,101
49170 :000,015,001,254,000,000,032
49176 :000,000,000,000,083,067,174
49182 :079,082,069,032,058,032,126
49188 :000,083,072,073,080,083,171
49194 :032,058,032,000,065,084,057
49200 :084,065,067,075,032,032,147
49206 :000,000,000,032,032,032,150
49212 :032,032,032,032,032,032,252
49218 :032,032,032,032,032,032,002
49224 :000,000,000,000,000,000,072
49230 :173,000,220,041,015,201,216
49236 :015,240,008,201,011,240,031
49242 :007,201,007,240,045,076,154
49248 :182,192,173,000,208,056,139
49254 :233,001,144,003,076,118,165
49260 :192,141,000,208,206,016,103
49266 :208,076,182,192,170,173,091
49272 :016,208,041,001,240,003,117
49278 :142,000,208,236,016,192,152
49284 :144,048,142,000,208,076,238
49290 :182,192,173,000,208,024,149
49296 :105,001,176,003,076,160,153
49302 :192,141,000,208,238,016,177
49308 :208,076,182,192,170,173,133
49314 :016,208,041,001,208,006,130
49320 :142,000,208,076,182,192,200
49326 :236,017,192,176,003,142,172
49332 :000,208,173,014,192,208,207
49338 :015,173,000,220,041,016,139
49344 :208,008,169,001,141,014,221
49350 :192,076,203,192,096,173,106
49356 :016,208,041,001,208,011,177
49362 :173,016,208,041,239,141,004
49368 :016,208,076,229,192,173,086
49374 :016,208,009,016,141,016,116
49380 :208,173,001,208,233,022,049
49386 :141,009,208,173,000,208,205
49392 :141,008,208,169,001,141,140
49398 :014,192,076,023,193,169,145
49404 :033,141,004,212,174,073,121
49410 :192,202,142,073,192,142,177
49416 :001,212,173,009,208,056,155
49422 :233,002,141,009,208,201,040
49428 :030,144,017,173,030,208,110
49434 :141,003,192,041,016,240,147
49440 :006,032,068,193,076,040,191
49446 :193,096,169,196,141,252,061
49452 :007,169,200,141,073,192,058
49458 :169,000,141,001,212,141,202
49464 :000,212,141,009,208,141,255
49470 :008,208,141,014,192,096,209
49476 :173,003,192,041,014,141,120
49482 :003,192,032,128,193,208,062
49488 :001,096,141,008,192,010,016
49494 :141,010,192,172,008,192,033
49500 :169,197,145,251,160,015,005
49506 :032,152,193,032,003,197,195
49512 :173,003,192,073,255,045,077
49518 :016,208,141,016,208,172,103
49524 :008,192,152,024,105,192,021
49530 :145,251,032,161,193,096,232
49536 :201,002,208,003,169,001,200
49542 :096,201,004,208,003,169,047
49548 :002,096,201,008,208,003,146
49554 :169,003,096,169,000,096,167
49560 :162,255,202,208,253,136,088
49566 :208,248,096,160,001,177,024
49572 :253,105,005,145,253,201,102
49578 :010,144,019,056,233,010,130
49584 :145,253,200,192,007,240,189
49590 :009,177,253,105,001,145,104
49596 :253,076,169,193,173,022,050
49602 :192,105,048,141,017,004,189
49608 :173,023,192,105,048,141,114
49614 :016,004,141,016,004,173,048
49620 :024,192,105,048,141,015,225
49626 :004,173,025,192,105,048,253
49632 :141,014,004,173,026,192,006
49638 :105,048,141,013,004,096,125
49644 :032,003,194,009,030,141,133
49650 :011,192,032,003,194,041,203
49656 :031,141,012,192,096,032,240
49662 :003,194,041,003,096,169,248
49668 :255,141,015,212,169,128,156
49674 :141,018,212,173,027,212,025
49680 :096,032,001,196,172,027,028
49686 :192,136,032,003,194,041,108
49692 :031,201,031,208,014,032,033
49698 :003,194,024,105,001,041,146
49704 :003,170,202,138,153,074,012
49710 :192,185,074,192,141,077,139
49716 :192,173,027,192,010,141,019
49722 :010,192,168,173,077,192,102
49728 :201,001,240,007,201,002,204
49734 :240,055,076,174,194,177,218
49740 :247,056,233,001,170,144,159
49746 :003,076,102,194,145,247,081
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49758 :016,208,141,016,208,076,247
49764 :174,194,173,016,208,045,142
49770 :018,192,240,006,138,145,077
49776 :247,076,174,194,236,016,031
49782 :192,144,053,138,145,247,013
49788 :076,174,194,177,247,024,248
49794 :105,001,170,176,003,076,149
49800 :152,194,145,247,173,016,039
49806 :208,013,018,192,141,016,218
49812 :208,076,174,194,173,016,221
49818 :208,045,018,192,208,006,063
49824 :138,145,247,076,174,194,110
49830 :236,017,192,176,003,138,160
49836 :145,247,177,249,024,105,095
49842 :001,145,249,201,230,144,124
49848 :003,076,059,195,177,249,175
49854 :201,060,176,001,096,173,129
49860 :030,208,041,015,208,001,187
49866 :096,141,003,192,041,001,164
49872 :240,004,032,059,195,096,066
49878 :173,003,192,041,002,240,097
49884 :005,169,001,032,251,194,104
49890 :173,003,192,041,004,240,111
49896 :005,169,002,032,251,194,117
49902 :173,003,192,041,008,240,127
49908 :005,169,003,032,251,194,130
49914 :096,141,008,192,010,141,070
49920 :010,192,172,008,192,169,231
49926 :197,145,251,169,129,141,014
49932 :011,212,160,020,032,152,087
49938 :193,169,128,141,011,212,104
49944 :160,020,032,152,193,032,101
49950 :003,197,169,001,174,008,070
49956 :192,010,202,208,252,073,205
49962 :255,045,016,208,141,016,211
49968 :208,173,008,192,168,024,053
49974 :105,192,145,251,096,172,247
49980 :027,192,169,199,145,251,019
49986 :169,129,141,011,212,152,112
49992 :010,168,177,247,056,233,195
49998 :012,145,247,176,011,173,074
50004 :018,192,073,255,045,016,171
50010 :208,141,016,208,173,018,086
50016 :192,141,029,208,160,020,078
50022 :032,152,193,173,030,208,122
50028 :041,001,240,003,032,157,070
50034 :195,160,030,032,152,193,108
50040 :169,128,141,011,212,032,045
50046 :003,197,169,255,077,018,077
50052 :192,045,016,208,141,016,238
50058 :208,172,027,192,152,024,145
50064 :105,192,145,251,032,032,133
50070 :196,169,000,141,029,208,125
50076 :096,169,000,141,014,192,000
50082 :141,001,212,141,000,212,101
50088 :141,004,212,141,008,208,114
50094 :141,009,208,169,017,045,251
50100 :021,208,141,021,208,169,180
50106 :198,141,248,007,160,255,171
50112 :032,152,193,169,000,141,111
50118 :021,208,141,016,208,169,193
50124 :180,141,000,208,169,230,108
50130 :141,001,208,169,192,141,038
50136 :248,007,032,235,195,032,197
50142 :014,196,173,013,192,240,026
50148 :005,169,031,141,021,208,035
50154 :096,160,002,032,236,193,185

50160 :173,012,192,145,249,173,160
50166 :011,192,145,247,200,200,217
50172 :192,008,208,237,096,169,138
50178 :001,174,027,192,010,202,096
50184 :208,252,141,018,192,096,147
50190 :206,013,192,173,013,192,035
50196 :024,105,048,141,034,004,120
50202 :169,001,141,034,216,096,171
50208 :032,063,196,173,003,192,179
50214 :208,014,160,001,177,253,083
50220 :240,009,170,202,138,145,180
50226 :253,032,192,193,096,169,217
50232 :009,145,253,200,076,042,013
50238 :196,160,001,177,253,208,033
50244 :011,200,192,006,208,247,164
50250 :169,001,141,003,192,096,164
50256 :169,000,141,003,192,096,169
50262 :032,035,197,173,141,002,154
50268 :208,251,238,027,192,173,157
50274 :027,192,201,004,208,005,223
50280 :169,001,141,027,192,032,154
50286 :078,192,173,014,192,240,231
50292 :008,032,251,192,173,004,008
50298 :192,240,019,032,023,197,057
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50316 :204,076,232,200,169,000,253
50322 :141,009,208,141,008,208,093
50328 :141,004,212,141,011,212,105
50334 :141,000,212,141,001,212,097
50340 :169,001,141,003,192,032,190
50346 :165,200,206,007,192,206,122
50352 :007,192,206,007,192,169,181
50358 :000,141,014,192,141,073,231
50364 :192,141,021,208,141,027,150
50370 :192,160,060,032,152,193,215
50376 :173,005,192,024,105,003,190
50382 :141,004,192,141,005,192,113
50388 :238,006,192,032,235,195,086
50394 :169,180,141,000,208,169,061
50400 :230,141,001,208,169,254,203
50406 :045,016,208,141,016,208,096
50412 :169,031,141,021,208,169,207
50418 :010,160,020,032,152,193,041
50424 :170,202,138,208,246,032,220
50430 :044,200,076,089,196,032,123
50436 :236,193,172,010,192,173,212
50442 :012,192,145,249,173,011,024
50448 :192,145,247,206,004,192,234
50454 :096,174,007,192,160,007,146
50460 :136,208,253,202,208,248,003
50466 :096,169,000,141,030,208,166
50472 :141,004,212,141,011,212,249
50478 :141,022,192,141,023,192,245
50484 :141,024,192,141,025,192,255
50490 :141,026,192,141,056,192,038
50496 :141,055,192,141,007,212,044
50502 :141,032,208,141,033,208,065
50508 :133,247,032,203,199,169,035
50514 :006,141,037,208,169,009,140
50520 :141,038,208,169,230,141,247
50526 :013,208,141,015,208,160,071
50532 :000,169,001,153,000,216,127
50538 :200,192,006,208,248,160,096
50544 :000,169,192,153,248,007,113
50550 :024,105,001,200,192,009,137
50556 :208,245,169,031,141,028,178
50562 :208,141,021,208,169,180,033
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50568 :141,000,208,169,230,141,001
50574 :001,208,169,075,141,007,231
50580 :192,169,004,141,013,192,091
50586 :169,032,141,004,192,141,065
50592 :005,192,169,007,141,039,201
50598 :208,169,002,141,040,208,166
50604 :169,004,141,041,208,169,136
50610 :005,141,042,208,169,007,238
50616 :141,043,208,169,048,141,166
50622 :018,004,169,017,141,005,032
50628 :212,169,241,141,006,212,153
50634 :169,200,141,001,212,141,042
50640 :000,212,169,015,141,024,001
50646 :212,169,031,141,012,212,223
50652 :169,250,141,013,212,169,150
50658 :015,141,008,212,032,235,101
50664 :195,169,255,141,073,192,233
50670 :169,001,141,044,208,169,202
50676 :208,133,248,169,001,133,112
50682 :249,169,208,133,250,169,148
50688 :248,133,251,169,007,133,173
50694 :252,169,021,133,253,169,235
50700 :192,133,254,032,048,198,101
50706 :032,104,198,032,044,200,116
50712 :032,014,196,096,169,001,020
50718 :141,000,216,141,001,216,233
50724 :141,002,216,141,003,216,243
50730 :141,004,216,141,005,216,253
50736 :169,147,032,210,255,024,117
50742 :160,005,162,000,032,240,141
50748 :255,169,028,160,192,032,128
50754 :030,171,024,160,026,162,127
50760 :000,032,240,255,169,037,037
50766 :160,192,032,030,171,169,064
50772 :048,141,017,004,141,016,195
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50784 :004,141,013,004,141,018,161
50790 :004,096,169,005,133,105,102
50796 :169,216,133,106,160,000,124
50802 :169,001,145,105,200,192,158
50808 :030,208,249,169,240,133,125
50814 :105,160,000,169,001,145,194
50820 :105,200,192,012,208,249,074
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50880 :000,000,000,000,000,000,192
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50940 :000,000,000,000,000,000,252
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50952 :000,000,000,000,000,000,008
50958 :000,000,000,000,000,000,014
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51012 :000,000,000,000,000,000,068
51018 :000,064,000,001,016,000,155
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51036 :064,000,065,000,000,065,030
51042 :000,000,000,000,000,020,118
51048 :000,085,020,085,000,020,058
51054 :000,000,000,000,000,065,175
51060 :000,000,065,000,001,000,182
51066 :064,001,000,064,004,000,255
51072 :016,016,000,004,016,000,180
51078 :004,064,000,001,000,000,203
51084 :000,000,000,000,000,000,140
51090 :004,000,001,005,064,005,225
51096 :004,080,001,021,080,017,099
51102 :016,000,001,005,017,065,006
51108 :021,081,080,004,081,016,191
51114 :021,004,081,069,005,016,110
51120 :016,020,005,017,016,001,251
51126 :017,000,000,001,000,000,200
51132 :020,000,000,069,000,000,021
51138 :020,000,000,000,000,000,214
51144 :000,000,000,160,063,185,096
51150 :139,198,153,000,048,136,112
51156 :016,247,160,063,185,203,062
51162 :198,153,064,048,153,128,194
51168 :048,153,192,048,136,016,049
51174 :241,160,063,185,011,199,065
51180 :153,000,049,136,016,247,069
51186 :160,063,185,075,199,153,053
51192 :064,049,136,016,247,160,152
51198 :063,185,139,199,153,128,097
51204 :049,136,016,247,162,003,105
51210 :160,000,169,170,032,036,065
51216 :200,169,000,162,003,032,070
51222 :036,200,192,064,176,007,185
51228 :162,003,169,170,076,014,110
51234 :200,096,153,192,049,200,156
51240 :202,208,249,096,024,160,211
51246 :015,162,010,032,240,255,248
51252 :169,046,160,192,032,030,169
51258 :171,032,083,200,160,255,191
51264 :032,152,193,024,160,015,128
51270 :162,010,032,240,255,169,170
51276 :057,160,192,032,030,171,206
51282 :096,173,055,192,024,105,215
51288 :001,201,010,144,005,238,175
51294 :056,192,169,000,141,055,195
51300 :192,173,056,192,024,105,074
51306 :048,141,167,005,173,055,183
51312 :192,024,105,048,141,168,022
51318 :005,169,001,141,167,217,050
51324 :141,168,217,160,200,032,018
51330 :152,193,096,152,160,002,117
51336 :032,152,193,168,173,003,089
51342 :192,009,000,141,003,192,167
51348 :177,249,201,030,144,010,191
51354 :170,202,138,145,249,169,203
51360 :001,141,003,192,096,173,254
51366 :003,192,208,001,096,169,067
51372 :000,141,003,192,160,002,158
51378 :032,133,200,200,200,032,207
```

```
51384 :133,200,200,200,032,133,058
51390 :200,076,165,200,071,065,199
51396 :077,069,032,079,086,069,096
51402 :082,000,080,082,069,083,086
51408 :083,032,084,082,073,071,121
51414 :071,069,082,032,084,079,119
51420 :032,080,076,065,089,032,082
51426 :065,071,065,073,078,000,066
51432 :169,000,141,021,208,024,027
51438 :160,015,162,010,032,240,089
51444 :255,169,194,160,200,032,230
51450 :030,171,024,160,006,162,035
51456 :013,032,240,255,169,204,145
51462 :160,200,032,030,171,173,004
51468 :000,220,041,016,208,249,234
51474 :076,086,196,013,013,013,159
```

Letter Attack

(Article on page 70.)

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs," "A Beginner's Guide To Typing In Programs," and "The Automatic Proofreader" that appear before the Program Listings.

Program 1:
Letter Attack—VIC Version

```
10 POKE36879,26                          :rem 53
20 HS=0:BT=9999:V=36878:S=36875:N=36877:A
   =30720:B=7682                         :rem 39
30 PRINT "{CLR}{10 DOWN}{4 RIGHT}LETTER A
   TTACK!"                               :rem 142
50 FORT=1TO1500:NEXT                     :rem 240
100 PRINT"{CLR}":SC=0:TM=0:POKE 198,0
                                         :rem 225
110 PRINT "{5 DOWN}{2 SPACES}CHOOSE DIFFI
    CULTY"                               :rem 108
120 PRINT "{DOWN}{4 SPACES}LEVEL ({RVS}1
    {OFF} - {RVS}9{OFF})"                :rem 29
130 DL$="":GET DL$:IF DL$="" THEN 130
                                         :rem 88
150 IF DL$<"1" OR DL$>"9" THEN 130:rem 93
160 DL=VAL(DL$):DL=10-DL:POKE 198,0
                                         :rem 216
170 PRINT "{2 DOWN}{2 SPACES}HOW MANY LET
    TERS"                                :rem 209
180 PRINT "{DOWN}{2 SPACES}WOULD YOU LIKE
    ?"                                   :rem 103
190 PRINT "{DOWN}{6 SPACES}{RVS}1{OFF}0 -
     {RVS}9{OFF}0"                       :rem 187
200 NL$="":GET NL$:IF NL$="" THEN 200
                                         :rem 114
210 PRINT NL$                            :rem 222
220 IF NL$<"1" OR NL$>"9" THEN 200
                                         :rem 109
230 NL=VAL(NL$):NL=NL*10:LR=NL           :rem 67
270 PRINT"{CLR}"                         :rem 253
280 POKE 38400,2:POKE 7680,77:POKE 38404,
    2:POKE 7684,78                       :rem 165
290 FOR I=7703 TO 8143 STEP 22           :rem 236
300 POKE I+A,2:POKE I,101:POKE I+A+2,2:PO
    KE I+2,103                           :rem 237
310 NEXT I                               :rem 28
320 POKE 38884,2:POKE 8164,78:POKE 38888,
    2:POKE 8168,77                       :rem 188
330 PRINT "{BLK}{HOME}{DOWN}{8 RIGHT}DIFF
    ICULTY"                              :rem 246
340 PRINT "{8 RIGHT}LEVEL:"              :rem 2
350 PRINT "{DOWN}{11 RIGHT}";10-DL:rem 18
360 PRINT "{DOWN}{8 RIGHT}LETTERS"
                                         :rem 134
370 PRINT "{8 RIGHT}REMAINING:"          :rem 39
380 PRINT "{DOWN}{11 RIGHT}";LR          :rem 149
390 PRINT "{DOWN}{8 RIGHT}SCORE:"        :rem 28
400 PRINT "{3 DOWN}{8 RIGHT}HIGH SCORE:"
                                         :rem 86
410 PRINT "{DOWN}{11 RIGHT}";HS          :rem 140
420 IF BT<>9999 THEN POKE BT+30718,4:POKE
     BT-2,62                             :rem 141
470 FOR I=38402 TO 38886 STEP 22         :rem 93
480 POKE I,6                             :rem 118
490 NEXT I                               :rem 37
500 LE=INT(RND(1)*26+1):LC=LE+64         :rem 31
510 FOR J=1 TO 26                        :rem 64
520 POKE B,J                             :rem 126
530 FORT=1TO20:NEXT                      :rem 191
540 NEXT J                               :rem 34
550 FOR I=1 TO LE                        :rem 108
560 POKE B,I                             :rem 129
570 NEXT I                               :rem 36
580 POKE B,32:A$="":CN=0:POKEV,15:POKE 19
    8,0                                  :rem 175
590 FOR I=7704 TO 8166 STEP 22           :rem 245
600 POKE S,220-CN                        :rem 150
610 POKE I,LE                            :rem 204
620 FOR J=1 TO DL                        :rem 106
630 IF A$="" THEN GET A$                 :rem 130
640 NEXT J                               :rem 35
650 IF A$="" THEN 680                    :rem 221
660 IF ASC(A$)=LC THEN 820               :rem 77
670 A$=""                                :rem 131
680 POKE I,32                            :rem 167
690 CN=CN+3                              :rem 92
700 NEXT I                               :rem 31
710 POKE S,0:POKE V,0                    :rem 145
720 FORT=1TO100:NEXT                     :rem 239
730 LR=LR-1                              :rem 113
740 PRINT "{HOME}{9 DOWN}{11 RIGHT}
    {6 SPACES}"                          :rem 87
750 PRINT "{HOME}{9 DOWN}{11 RIGHT}";LR
                                         :rem 49
760 IF LR=0 THEN 1010                    :rem 40
770 GOTO 500                             :rem 108
780 REM                                  :rem 131
820 POKE I+30722,5:POKE I+2,31:POKE S,0:P
    OKE V,0:POKE V,15:POKE N,175         :rem 63
830 FOR K=1 TO 30                        :rem 65
840 POKE I,81                            :rem 169
850 FORT=1TO20:NEXT                      :rem 196
860 POKE I,87                            :rem 177
870 FORT=1TO20:NEXT                      :rem 198
880 NEXT K                               :rem 42
890 POKE I,32:POKE N,0:POKE V,0          :rem 216
900 IF I<BT THEN BT=I                    :rem 142
910 TM=TM+(I-7682)/22:SC=SC+1:LR=LR-1
                                         :rem 133
920 PRINT "{HOME}{9 DOWN}{11 RIGHT}
    {6 SPACES}"                          :rem 87
930 PRINT "{HOME}{9 DOWN}{11 RIGHT}";LR
                                         :rem 49
940 PRINT "{3 DOWN}{11 RIGHT}";SC:rem 177
950 IF LR=0 THEN 1010                    :rem 41
960 GOTO 500                             :rem 109
1010 FORT=1TO750:NEXT                    :rem 35
```

```
1020 PRINT "{CLR}{2 DOWN}SCORE:";SC
                                    :rem 208
1030 IF SC>HS THEN HS=SC            :rem 95
1040 PRINT "{2 DOWN}HIGH SCORE:";HS
                                    :rem 100
1050 PRINT "{2 DOWN}HIGHEST POSSIBLE"
                                    :rem 38
1060 PRINT "SCORE:";NL              :rem 35
1070 ER=(SC/NL)*100                  :rem 7
1080 PRINT "{2 DOWN}EFFICIENCY"     :rem 145
1090 PRINT "RATING:";ER;"%"         :rem 16
1100 IF SC=0 THEN AT=0:GOTO 1120    :rem 188
1110 AT=INT(TM/SC)                  :rem 55
1120 PRINT "{2 DOWN}AVERAGE TIME:";AT
                                    :rem 235
1130 PRINT "({RVS}1{OFF} - GOOD {RVS}22
     {OFF} -BAD)"                   :rem 14
1140 PRINT "{2 DOWN}WOULD YOU LIKE TO"
                                    :rem 9
1150 PRINT "PLAY AGAIN? (Y OR N)"   :rem 6
1160 POKE 198,0                     :rem 245
1170 A$="":GET A$:IF A$="" THEN 1170
                                    :rem 213
1180 IF A$="Y" THEN 100             :rem 88
1185 IFA$<>"N"THEN1170              :rem 199
1190 PRINT"{CLR}":END                :rem 64
```

Program 2:

Letter Attack—64 Version

```
10 POKE53280,2:POKE 53281,1         :rem 185
20 HS=0:BT=9999:V=54296:S=54273:N=128:A=5
   4272:B=1027:TAB$="{10 RIGHT}"    :rem 120
22 FOR I=ATOA+24:POKEI,0:NEXT       :rem 14
25 POKE 54277,100:POKE 54278,100    :rem 140
30 PRINT "{CLR}{10 DOWN}{13 RIGHT}LETTER
   {SPACE}ATTACK!"                  :rem 147
50 FORT=1TO1000:NEXT                :rem 235
100 PRINT"{CLR}":SC=0:TM=0:POKE 198,0
                                    :rem 225
110 PRINT "{4 DOWN}"TAB$"CHOOSE DIFFICULT
    Y"                              :rem 154
120 PRINT TAB$"LEVEL ({RVS}1{OFF} - {RVS}
    9{OFF})"                         :rem 7
130 DL$="":GET DL$:IF DL$="" THEN 130
                                    :rem 88
140 IF DL$<"1" OR DL$>"9" THEN 130:rem 92
150 PRINT TAB$ DL$                  :rem 210
160 DL=VAL(DL$):DL=10-DL:POKE 198,0
                                    :rem 216
170 PRINT TAB$"{2 DOWN}HOW MANY LETTERS"
                                    :rem 204
180 PRINT TAB$"WOULD YOU LIKE?"     :rem 81
190 PRINT TAB$"{DOWN}{RVS}1{OFF}0 - {RVS}
    9{OFF}0"                        :rem 182
200 NL$="":GET NL$:IF NL$="" THEN 200
                                    :rem 114
210 IF NL$<"1" OR NL$>"9" THEN 200
                                    :rem 108
220 PRINT NL$                       :rem 223
230 NL=VAL(NL$):NL=NL*10:LR=NL       :rem 67
270 PRINT"{CLR}"                    :rem 253
280 POKE 55296,2:POKE 1024,77:POKE 55302,
    2:POKE 1030,78                  :rem 138
290 FOR I=1065 TO 1945 STEP 40      :rem 234
300 POKE I+A,2:POKE I,101:POKE I+A+4,2:PO
    KE I+4,103                      :rem 241
310 NEXT I                           :rem 28
320 POKE 56256,2:POKE 1984,78:POKE 56262,
    2:POKE 1990,77                  :rem 166
330 PRINT "{BLK}{HOME}{DOWN}{8 RIGHT}DIFF
    ICULTY"                         :rem 246
340 PRINT "{8 RIGHT}LEVEL:"          :rem 2
350 PRINT "{DOWN}{11 RIGHT}";10-DL:rem 18
360 PRINT "{DOWN}{8 RIGHT}LETTERS"
                                    :rem 134
370 PRINT "{8 RIGHT}REMAINING:"     :rem 39
380 PRINT "{DOWN}{11 RIGHT}";LR     :rem 149
390 PRINT "{DOWN}{8 RIGHT}SCORE:"   :rem 28
400 PRINT "{3 DOWN}{8 RIGHT}HIGH SCORE:"
                                    :rem 86
410 PRINT "{DOWN}{11 RIGHT}";HS     :rem 140
420 IF BT<>9999 THEN POKE BT+54269,4:POKE
     BT-3,62                        :rem 149
470 FOR I=55299 TO 56259 STEP 40    :rem 100
480 POKE I,6                        :rem 118
490 NEXT I                          :rem 37
500 LE=INT(RND(1)*26+1):LC=LE+64    :rem 31
510 FOR J=1 TO 26                   :rem 64
520 POKE B,J                        :rem 126
530 FORT=1TO20:NEXT                 :rem 191
540 NEXT J                          :rem 34
550 FOR I=1 TO LE                   :rem 108
560 POKE B,I                        :rem 129
570 NEXT I                          :rem 36
580 POKE B,32:A$="":CN=0:POKEV,15:POKE 19
    8,0                             :rem 175
585 POKE 54276,17                   :rem 109
590 FOR I=1027 TO 1988 STEP 40      :rem 242
600 POKE S,220-CN                   :rem 150
610 POKE I,LE                       :rem 204
620 FOR J=1 TO DL                   :rem 106
630 IF A$="" THEN GET A$            :rem 130
640 NEXT J                          :rem 35
650 IF A$="" THEN 680               :rem 221
660 IF ASC(A$)=LC THEN 820          :rem 77
670 A$=""                           :rem 131
680 POKE I,32                       :rem 167
690 CN=CN+3                         :rem 92
700 NEXT I                          :rem 31
710 POKE 54276,16                   :rem 98
720 FORT=1TO100:NEXT                :rem 239
730 LR=LR-1                         :rem 113
740 PRINT "{HOME}{9 DOWN}{11 RIGHT}
    {6 SPACES}"                     :rem 87
750 PRINT "{HOME}{9 DOWN}{11 RIGHT}";LR
                                    :rem 49
760 IF LR=0 THEN 1010               :rem 40
770 GOTO 500                        :rem 108
820 POKE I+A+3,5:POKE I+3,31:POKE S,20:PO
    KE V,15:POKE 54276,129          :rem 177
830 FOR K=1 TO 30                   :rem 65
840 POKE I,81                       :rem 169
850 FORT=1TO20:NEXT                 :rem 196
860 POKE I,87                       :rem 177
870 FORT=1TO20:NEXT                 :rem 198
880 NEXT K                          :rem 42
890 POKE I,32:POKE 54276,128        :rem 226
900 IF I<BT THEN BT=I               :rem 142
910 TM=TM+(I-1026)/40:SC=SC+1:LR=LR-1
                                    :rem 119
920 PRINT "{HOME}{9 DOWN}{11 RIGHT}
    {6 SPACES}"                     :rem 87
930 PRINT "{HOME}{9 DOWN}{11 RIGHT}";LR
                                    :rem 49
940 PRINT "{3 DOWN}{11 RIGHT}";SC:rem 177
950 IF LR=0 THEN 1010               :rem 41
960 GOTO 500                        :rem 109
1010 FORT=1TO750:NEXT               :rem 35
1020 PRINT "{CLR}{2 DOWN}"TAB$"SCORE:";SC
                                    :rem 15
1030 IF SC>HS THEN HS=SC            :rem 95
1040 PRINT TAB$"{2 DOWN}HIGH SCORE:";HS
                                    :rem 95
```

```
1050 PRINT TAB$"{2 DOWN}HIGHEST POSSIBLE"
                                        :rem 33
1060 PRINT TAB$"SCORE:";NL              :rem 30
1070 ER=(SC/NL)*100                      :rem 7
1080 PRINT TAB$"{2 DOWN}EFFICIENCY"
                                        :rem 140
1090 PRINT TAB$"RATING:";ER;"%"         :rem 11
1100 IF SC=0 THEN AT=0:GOTO 1120        :rem 188
1110 AT=INT(TM/SC)                      :rem 55
1120 PRINT TAB$"{2 DOWN}AVERAGE TIME:";AT
                                        :rem 230
1130 PRINT TAB$"({RVS}1{OFF} - GOOD {RVS}
     22{OFF} -BAD)"                     :rem 9
1140 PRINT TAB$"{2 DOWN}WOULD YOU LIKE TO
     "                                  :rem 4
1150 PRINT TAB$"PLAY AGAIN? (Y OR N)"
                                        :rem 1
1160 POKE 198,0                        :rem 245
1170 A$="":GET A$:IF A$="" THEN 1170
                                        :rem 213
1180 IF A$="Y" THEN 100                 :rem 88
1181 IFA$<>"N"THEN1170                 :rem 195
1190 PRINT"{CLR}":END                   :rem 64
```

Machine Language For Beginners

(Article on page 108.)

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs," "A Beginner's Guide To Typing In Programs," and "The Automatic Proofreader" that appear before the Program Listings.

Program 2: 64 Easydir

```
830 JSR 979
833 JSR 65484
836 JSR 65484
839 LDX #1
841 JSR 65478
844 JSR 65508
847 JSR 65508
850 LDY #29
852 JSR 65508
855 JSR 65490
858 DEY
859 BNE 852
861 LDA #13
863 JSR 65490
866 JMP 896
869 JSR 959
872 JSR 65508
875 CMP #13
877 BEQ 935
879 CMP #34
881 BNE 872
883 JSR 65508
886 CMP #34
888 BEQ 896
890 JSR 65490
893 JMP 883
896 JSR 65508
899 BEQ 914
901 CMP #42
903 BNE 896
905 JSR 65490
908 JSR 65490
911 JMP 896
914 JSR 65508
917 JSR 65508
920 JSR 65508
923 STA 1013
926 JSR 65508
929 STA 1012
932 JMP 869
935 LDA #70
937 JSR 65490
940 LDA #82
942 JSR 65490
945 LDA #69
947 JSR 65490
950 LDA #1
952 JSR 65475
955 JSR 65484
958 RTS
959 LDA #32
961 JSR 65490
964 LDA 1012
967 LDX 1013
970 JSR 48589
973 LDA #45
975 JSR 65490
978 RTS
979 JSR 65484
982 LDA #1
984 STA 184
986 LDA #8
988 STA 186
990 LDA #0
992 STA 185
994 LDA #2
996 STA 183
998 LDA #242
1000 STA 187
1002 LDA #3
1004 STA 188
1006 JSR 57793
1009 RTS
1010 BIT 48
1012 BRK
1013 BRK
```

Program 2a: VIC Substitutions

```
970 JSR 56781
1006 JSR 57790
```

Program 3: BASIC Loader For Easydir

```
800 FOR ADRES=830TO1011:READ DATTA
810 POKE ADRES,DATTA:NEXT ADRES
830 DATA 32, 211, 3, 32, 204, 255
836 DATA 32, 204, 255, 162, 1, 32
842 DATA 198, 255, 32, 228, 255, 32
848 DATA 228, 255, 160, 29, 32, 228
854 DATA 255, 32, 210, 255, 136, 208
860 DATA 247, 169, 13, 32, 210, 255
866 DATA 76, 128, 3, 32, 191, 3
872 DATA 32, 228, 255, 201, 13, 240
878 DATA 56, 201, 34, 208, 245, 32
884 DATA 228, 255, 201, 34, 240, 6
890 DATA 32, 210, 255, 76, 115, 3
896 DATA 32, 228, 255, 240, 13, 201
902 DATA 42, 208, 247, 32, 210, 255
908 DATA 32, 210, 255, 76, 128, 3
914 DATA 32, 228, 255, 32, 228, 255
920 DATA 32, 228, 255, 141, 245, 3
926 DATA 32, 228, 255, 141, 244, 3
932 DATA 76, 101, 3, 169, 70, 32
938 DATA 210, 255, 169, 82, 32, 210
944 DATA 255, 169, 69, 32, 210, 255
950 DATA 169, 1, 32, 195, 255, 32
956 DATA 204, 255, 96, 169, 32, 32
962 DATA 210, 255, 173, 244, 3, 174
968 DATA 245, 3, 32, 205, 189, 169
974 DATA 45, 32, 210, 255, 96, 32
980 DATA 204, 255, 169, 1, 133, 184
986 DATA 169, 8, 133, 186, 169, 0
992 DATA 133, 185, 169, 2, 133, 183
998 DATA 169, 242, 133, 187, 169, 3
1004 DATA 133, 188, 32, 193, 225, 96
1010 DATA 36, 48
```

Program 3a: VIC Substitutions

```
968 DATA 245, 3, 32, 205, 221, 169
1004 DATA 133, 188, 32, 190, 225, 96
```

Program 4: Direct Machine Language Save Routine

```
10 REM MACHINE LANGUAGE SAVE TO DISK
20 OPEN1,8,1,"0:NAME"
30 INPUT "ML PROGRAM'S STARTING ADDRESS"
   ;SA
40 INPUT "ITS ENDING ADDRESS";EA:EA=EA+1
   :POKE780,253
50 SH=SA/256:SH%=SH:S1=SH-SH%:SL%=S1*256
60 EH=EA/256:EH%=EH:E1=EH-EH%:EL%=E1*256
70 POKE253,SL%:POKE254,SH%:POKE781,EL%:P
   OKE782,EH%:SYS 65496:CLOSE1
```

Auto Line

(Article on page 130.)

Program 1: Auto Line—64 Version

```
10 SA=49152:REM CHANGE STARTING ADDRESS T
   O RELOCATE                          :rem 95
20 FORI=SATOSA+103:READA:X=X+A:POKEI,A:NE
   XT                                  :rem 27
30 SB=SA+29:POKESA+7,INT(SB/256):POKESA+2
   ,SB-INT(SB/256)*256                 :rem 51
40 SC=SA+88:POKESA+23,INT(SC/256):POKESA+
   18,SC-INT(SC/256)*256               :rem 162
50 IFX<>11563THENPRINT"ERROR IN DATA STAT
   EMENTS.":STOP                       :rem 183
60 IN=10:POKESA+46,IN:REM INCREMENT CHANG
   E                                   :rem 89
70 PRINT"{CLR}{RVS}SYS"STR$(SA)" TO RUN
   {OFF}":NEW                          :rem 112
80 DATA 120,169,29,141,2,3,169         :rem 195
90 DATA 192,141,3,3,169,0,133          :rem 138
100 DATA 20,133,21,169,88,141,20       :rem 23
110 DATA 3,169,192,141,21,3,88         :rem 191
120 DATA 96,173,21,3,201,234,208       :rem 27
130 DATA 6,32,138,255,76,131,164       :rem 38
140 DATA 165,20,24,105,10,133,99       :rem 27
150 DATA 165,21,105,0,133,98,162       :rem 30
160 DATA 144,56,32,73,188,32,221       :rem 39
170 DATA 189,162,0,189,1,1,240         :rem 191
180 DATA 6,157,119,2,232,208,245       :rem 39
190 DATA 169,32,157,119,2,232,134      :rem 90
200 DATA 198,76,131,164,32,225,255
                                       :rem 141
210 DATA 208,8,32,138,255,169,13       :rem 40
220 DATA 32,210,255,76,49,234          :rem 145
```

Program 2: Auto Line—VIC Version

Note: If using expansion memory, change line 10 as described in the article.

```
10 POKE56,30:POKE55,0:REM POINTERS TO NOR
   MAL TOP OF MEMORY ON VIC            :rem 151
20 PRINT"{CLR}PLACE AT TOP MEMORY,":PRINT
   "OR IN CASSETTE BUFFER"             :rem 17
30 INPUT"({RVS}T{OFF}/{RVS}C{OFF})";A$:IF
   A$<>"T"ANDA$<>"C"THEN30             :rem 65
40 IF A$="C" THEN SA=828:GOTO70        :rem 152
50 T=PEEK(55)+PEEK(56)*256:T=T-104:POKE56
   ,INT(T/256):POKE55,T-INT(T/256)*256:SA
   =T                                  :rem 232
60 POKE52,INT(T/256):POKE51,T-INT(T/256)*
   256                                 :rem 35
70 FORI=SATOSA+103:READA:X=X+A:POKEI,A:NE
   XT                                  :rem 32
80 SB=SA+29:POKESA+7,INT(SB/256):POKESA+2
   ,SB-INT(SB/256)*256                 :rem 56
90 SC=SA+88:POKESA+23,INT(SC/256):POKESA+
   18,SC-INT(SC/256)*256               :rem 167
100 IF X<>11575 THEN PRINT"ERROR IN DATA
    {SPACE}STATEMENTS.":END            :rem 119
110 IN=10:POKESA+46,IN:REM INCREMENT CHAN
    GE                                 :rem 133
120 PRINT"{CLR}{RVS}SYS"STR$(SA)" TO RUN
    {OFF}":NEW                         :rem 156
130 DATA 120,169,89,141,2,3,169        :rem 245
140 DATA 3,141,3,3,169,0,133           :rem 77
150 DATA 20,133,21,169,148,141,20      :rem 73
160 DATA 3,169,3,141,21,3,88           :rem 91
170 DATA 96,173,21,3,201,234,208       :rem 32
180 DATA 6,32,138,255,76,131,196       :rem 48
190 DATA 165,20,24,105,10,133,99       :rem 32
200 DATA 165,21,105,0,133,98,162       :rem 26
210 DATA 144,56,32,73,220,32,221       :rem 22
220 DATA 221,162,0,189,1,1,240        :rem 174
230 DATA 6,157,119,2,232,208,245       :rem 35
240 DATA 169,32,157,119,2,232,134      :rem 86
250 DATA 198,76,131,196,32,225,255
                                       :rem 151
260 DATA 208,8,32,138,255,169,13       :rem 45
270 DATA 32,210,255,76,191,234        :rem 196
```

Power Basic

(Article on page 158.)

Program 1: Time Clock—VIC Version

```
10 PRINT"{CLR}{RVS}PLEASE WAIT"  :rem 198
20 FORI=828TO1002:READA:X=X+A:POKEI,A:NEX
   T                                   :rem 153
30 IF X<>21647 THEN PRINT"ERROR IN DATA S
   TATEMENTS.":END                     :rem 74
40 SYS828:FR=1004:Z1=1                 :rem 12
50 PRINT"{CLR}{4 SPACES}{4 DOWN}CHOOSE:
   {DOWN}"                             :rem 25
60 PRINT"{4 SPACES}{RVS}{BLK}F1{OFF}{BLU}
   :STOP CLOCK"                        :rem 237
70 PRINT"{DOWN}{4 SPACES}{RVS}{BLK}F3
   {OFF}{BLU}:START CLOCK"             :rem 73
80 PRINT"{DOWN}{4 SPACES}{RVS}{BLK}F5
   {OFF}{BLU}:CLEAR CLOCK"             :rem 37
90 PRINT"{DOWN}{4 SPACES}{RVS}{BLK}F7
   {OFF}{BLU}:SET TIME"                :rem 112
100 GETA$:IFA$<CHR$(133)ORA$>CHR$(136)THE
    N100                               :rem 25
110 ON ASC(A$)-132 GOTO120,170,180,130
                                       :rem 148
120 POKEFR,Z1:GOTO100                  :rem 21
130 POKEFR,Z1:INPUT"{CLR}{2 DOWN}HOURS? 0
    0{4 LEFT}";H$:IFLEN(H$)<>2THEN130
                                       :rem 244
140 INPUT"MINUTES? 00{4 LEFT}";M$:IF LEN(
    M$)<>2 THEN 140                    :rem 39
150 INPUT"SECONDS? 00{4 LEFT}";S$:IF LEN(
    S$)<>2 THEN 150                    :rem 31
160 T$=H$+M$+S$+"00":FORI=1TO8:POKE1005+I
    ,ASC(MID$(T$,I)):NEXT:GOTO50       :rem 252
170 POKEFR,.:GOTO100                   :rem 189
180 POKEFR,Z1:SYS853:GOTO100           :rem 244
190 DATA 173,20,3,141,233,3,173        :rem 232
200 DATA 21,3,141,234,3,120,169        :rem 223
210 DATA 100,141,20,3,169,3,141        :rem 218
220 DATA 21,3,169,0,141,236,3          :rem 128
230 DATA 169,48,162,9,157,237,3          :rem 1
240 DATA 202,208,250,88,96,173,236
                                       :rem 146
250 DATA 3,208,53,162,8,24,189         :rem 199
260 DATA 237,3,105,1,141,235,3         :rem 179
270 DATA 201,58,208,5,169,48,141       :rem 44
280 DATA 235,3,138,41,1,240,12         :rem 180
290 DATA 173,235,3,201,54,208,5        :rem 240
300 DATA 169,48,141,235,3,173,235      :rem 89
```

```
310 DATA 3,157,237,3,202,240,7    :rem 182
320 DATA 201,48,208,249,76,107,3  :rem 39
330 DATA 173,238,3,201,50,208,15  :rem 27
340 DATA 173,239,3,201,52,208,8   :rem 241
350 DATA 169,48,141,238,3,141,239 :rem 96
360 DATA 3,162,8,160,12,169,9     :rem 146
370 DATA 133,253,133,251,173,136,2
                                  :rem 131
380 DATA 133,252,165,244,41,254,133
                                  :rem 186
390 DATA 254,173,134,2,145,253,189
                                  :rem 148
400 DATA 237,3,9,128,145,251,138  :rem 39
410 DATA 41,1,240,10,136,169,58   :rem 235
420 DATA 145,251,173,134,2,145,253
                                  :rem 131
430 DATA 136,202,208,225,76,49,234
                                  :rem 141
```

Program 2: Time Clock—64 Version

```
100 Y=PEEK(49269):IFY<>141THENGOSUB270
                                  :rem 37
110 POKE56335,0:PRINT"{CLR}{WHT}":INPUT"A
    M OR PM ({RVS}A{OFF}/{RVS}P{OFF})";A$
                                  :rem 153
120 IF A$<>"A" AND A$<>"P" THEN 110
                                  :rem 141
130 B=0:IF A$="P" THEN B=128      :rem 139
140 INPUT"{3 DOWN}TIME (HHMMSS FORMAT)";T
    $                             :rem 104
150 IF LEN(T$)<>6 THEN 140        :rem 65
160 IF VAL(LEFT$(T$,2))>12 THEN 250
                                  :rem 55
170 IF VAL(MID$(T$,3,2))>59 OR VAL(MID$(T
    $,5,2))>59 THEN 250           :rem 88
180 FORA=1TO5STEP2:D=VAL(MID$(T$,A,1)):D=
    D*16+VAL(MID$(T$,A+1,1))      :rem 209
190 POKE49154-(A-1)/2,D:NEXTA     :rem 120
200 IF LEFT$(T$,2)="12" THEN B=128-B
                                  :rem 51
210 POKE49154,PEEK(49154)AND127:POKE49154
    ,PEEK(49154)ORB               :rem 219
220 PRINT"{3 DOWN}{6 SPACES}PRESS ANY KEY
     TO START CLOCK"              :rem 147
230 GET A$:IF A$="" THEN 230      :rem 77
240 PRINT"{CLR}":SYS49155:END     :rem 76
250 PRINT"{DOWN}ERROR IN INPUT.":FORI=1TO
    1000:NEXT:GOTO140             :rem 21
260 REM ML LOADER                 :rem 204
270 I=49155                       :rem 39
280 READ A:IF A=256 THEN 300      :rem 157
290 POKE I,A:I=I+1:X=X+A:GOTO 280:rem 133
300 IF X<>13794 THEN PRINT"ERROR IN DATA
    {SPACE}STATEMENTS.":END       :rem 126
310 DATA 162,3,189,255            :rem 60
320 DATA 191,157,8,220,202,208,247
                                  :rem 134
330 DATA 169,0,141,8,220,120,169  :rem 29
340 DATA 32,141,20,3,169,192,141  :rem 27
350 DATA 21,3,88,96,169,58,141    :rem 210
360 DATA 29,4,173,134,2,141,29    :rem 192
370 DATA 216,162,3,160,0,189,8    :rem 194
380 DATA 220,41,112,74,74,74,74   :rem 246
390 DATA 24,105,176,153,30,4,173  :rem 35
400 DATA 134,2,153,30,216,200,189 :rem 73
410 DATA 8,220,41,15,24,105,176   :rem 232
420 DATA 153,30,4,173,134,2,153   :rem 230
430 DATA 30,216,200,202,208,213,173
                                  :rem 166
440 DATA 8,220,24,105,176,141,37  :rem 32
450 DATA 4,173,134,2,141,37,216   :rem 237
460 DATA 173,11,220,48,5,169,1    :rem 191
470 DATA 76,117,192,169,16,141,39:rem 104
480 DATA 4,173,134,2,141,39,216   :rem 242
490 DATA 76,49,234,0,256          :rem 167
500 RETURN                        :rem 117
```

3-D Labyrinth

(Article on page 96.)

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs," "A Beginner's Guide To Typing In Programs," and "The Automatic Proofreader" that appear before the Program Listings.

```
1 X=PEEK(648)*256:SYS 65517:GP=PEEK(781):
  IFGP=40THENCR$=CHR$(13)         :rem 230
2 DIM M%(17,17):O$="{DOWN}{2 SPACES}{RVS}
  PRESS ANY KEY":IFGP<>40THENPOKE36879,11
  0                               :rem 229
3 FORJ=1TO17:FOR I=2TO16:M%(1,J)=1:M%(17,
  J)=1:M%(I,17)=1:M%(I,1)=1:NEXTI,J
                                  :rem 172
4 FORI=3TO16STEP2:FORJ=3TO16STEP2:M%(I,J)
  =1:NEXTJ,I:AJ=0:Q$="N"          :rem 177
5 FORK=1TO37:I=INT(RND(1)*15)+2:J=INT(RND
  (1)*15)+2:M%(I,J)=1:NEXT:Q=1:B=2:C=2
                                  :rem 244
6 FORI=1TO26:READW:READY:M%(W,Y)=0:NEXT:R
  ESTORE:TI$="000000":E=0:D=-1:AI=D
                                  :rem 62
7 POKE198,0:PRINT"{CLR}{WHT}"TAB(10)Q$:IF
  M%(B+E,C+D)=1THEN32             :rem 35
8 PRINT"{HOME} {DOWN}M{DOWN}M{DOWN}M
  {DOWN}M{DOWN}M{DOWN}M{DOWN}M{DOWN}M
  {DOWN}M{DOWN}M{DOWN}M{DOWN}M{DOWN}M
  {DOWN}M{DOWN}M{DOWN}M{DOWN}M{DOWN}M
  {DOWN}M{DOWN}M"                 :rem 116
9 PRINT"{UP}N{UP}N{UP}N{UP}N{UP}N{UP}N
  {UP}N{UP}N{UP}N{UP}N{UP}N{UP}N{UP}/":PR
  INTTAB(13)"{UP}N{UP}N{UP}N{UP}N{UP}N
  {UP}N{UP}N{UP}N{HOME}"          :rem 224
10 IF M%(B+AI,C+AJ)=0THENGOSUB58  :rem 88
11 IFM%(B-AI,C-AJ)=0THENGOSUB60   :rem 86
12 IFM%(B+2*E,C+2*D)=1THEN38       :rem 5
13 IFM%(B+2*E+AI,C+2*D+AJ)=0THENGOSUB52
                                  :rem 236
14 IFM%(B+2*E-AI,C+2*D-AJ)=0THENGOSUB54
                                  :rem 243
15 IFM%(B+3*E,C+3*D)=1THEN40       :rem 3
16 IFM%(B+4*E,C+4*D)=1THEN45      :rem 11
17 IFM%(B+4*E+AI,C+4*D+AJ)=0THENGOSUB56
                                  :rem 248
18 IFM%(B+4*E-AI,C+4*D-AJ)=0THENGOSUB57
                                  :rem 254
19 IFM%(B+5*E,C+5*D)=1THEN47       :rem 18
20 GOSUB48:GETQ$:IFQ$=""THEN20     :rem 45
21 IFQ$="Q"THENPRINT"{CLR}":ZS=1:GOSUB63:
   GOTO76                         :rem 36
22 IFQ$="N"THENE=0:D=-1:AI=-1:AJ=0:GOTO7
                                  :rem 108
23 IFQ$="S"THENE=0:D=1:AI=1:AJ=0:GOTO7
                                  :rem 24
24 IFQ$="E"THENE=1:D=0:AI=0:AJ=-1:GOTO7
                                  :rem 56
```

```
25 IFQ$="W"THENE=-1:D=0:AI=0:AJ=1:GOTO7
                                        :rem 75
26 IF Q$="H"THENQ$="":GOSUB62:GOTO7
                                        :rem 38
27 IFQ$=" "THENQ$="":GOTO29            :rem 241
28 GOTO20                               :rem 5
29 IFM%(B+E,C+D)<>0THEN20               :rem 136
30 IF M%(B+2*E,C+2*D)=1THEN20           :rem 252
31 B=B+2*E:C=C+2*D:GOTO7                :rem 99
32 PRINT"{HOME}O[20 Y]P";CR$;:FORI=1TO19
                                        :rem 72
33 PRINT"[G]{20 SPACES}[M]";CR$;:NEXT
                                        :rem 43
34 PRINT"L[20 P]@{HOME}"               :rem 125
35 PRINT"{HOME}";TAB(10)Q$:IFB+E=2ANDC+D=
   1ANDQ$="N"THENPRINTTAB(8)"{UP}{RVS}STA
   RT"                                  :rem 10
36 IFB=16ANDC=16ANDQ$="S"THENPRINTTAB(7);
   "{WHT}{5 DOWN}{RVS}FINISH":FORI=1TO300
   :NEXT                                :rem 2
37 GOTO20                               :rem 5
38 PRINT"{HOME}{4 DOWN}{4 RIGHT}O[12 Y]P"
   :FORI=1TO12:PRINT"{4 RIGHT}[G]
   {12 SPACES}[M]":NEXT                 :rem 92
39 PRINT"{4 RIGHT}L[12 P]@":GOTO20:rem 64
40 PRINT"{HOME}{5 DOWN}{5 RIGHT}O[10 Y]P"
   :FORI=1TO10:PRINTTAB(5)"[G]{10 SPACES}
   [M]":NEXT                           :rem 252
41 PRINTTAB(5)"L[10 P]@"               :rem 239
42 IFB=2ANDC-3=1ANDQ$="N"THENPRINT"{HOME}
   {7 DOWN}"TAB(10)"{RVS}S"            :rem 93
43 IFB=16ANDC+3=17ANDQ$="S"THENPRINT"
   {HOME}{7 DOWN}"TAB(10)"{RVS}F":rem 192
44 GOTO20                               :rem 3
45 PRINT"{HOME}{8 DOWN}"TAB(8)"O[4 Y]P
   {DOWN}{6 LEFT}[G]{4 SPACES}[M]{DOWN}
   {6 LEFT}[G]{4 SPACES}[M]{DOWN}{6 LEFT}
   [G]{4 SPACES}[M]"                   :rem 21
46 PRINTTAB(8)"[G]{4 SPACES}[M]{DOWN}
   {6 LEFT}L[4 P]@":GOTO20             :rem 189
47 PRINT"{HOME}":PRINTTAB(9)"{8 DOWN}O
   [2 Y]P{DOWN}{4 LEFT}[G]{2 SPACES}[M]
   {DOWN}{4 LEFT}[G]{2 SPACES}[M]{DOWN}
   {4 LEFT}L[2 P]@":GOTO20             :rem 48
48 IFB<>16ORC<>16ORQ$<>"S"THENRETURN
                                        :rem 25
49 FORI=1TO1E3:NEXT:PRINT"{CLR}{3 DOWN}"T
   AB(5)"YOU MADE IT":PRINTTAB(5)"IN"VAL(
   TI$)"SEC"                            :rem 6
50 PRINT"{2 DOWN}"TAB(4)"{RVS}PRESS ANY K
   EY"                                 :rem 104
51 FORI=1TO1E3:NEXT:POKE198,0:GOSUB73:PRI
   NT"{CLR}":GOTO63                    :rem 206
52 PRINT"{HOME}{3 DOWN}{RIGHT}{DOWN}
   {2 RIGHT}[M] {DOWN}{2 LEFT}[M]P{DOWN}
   {2 LEFT}[2 M]{DOWN}{2 LEFT}[2 M]{DOWN}
   {2 LEFT}[2 M]{DOWN}{2 LEFT}[2 M]{DOWN}
   {2 LEFT}[2 M]{DOWN}{2 LEFT}[2 M]{DOWN}
   {2 LEFT}[2 M]{DOWN}{2 LEFT}[2 M]";
                                        :rem 132
53 PRINT"{DOWN}{2 LEFT}[M]@{DOWN}{2 LEFT}
   [M] ":RETURN                        :rem 241
54 PRINT"{HOME}":PRINTTAB(17)"{3 DOWN}
   [G]{DOWN}{2 LEFT}O[G]{DOWN}{2 LEFT}
   [2 G]{DOWN}{2 LEFT}[2 G]{DOWN}{2 LEFT}
   [2 G]{DOWN}{2 LEFT}[2 G]{DOWN}{2 LEFT}
   [2 G]{DOWN}{2 LEFT}[2 G]{DOWN}{2 LEFT}
   [2 G]{DOWN}{2 LEFT}[2 G]";          :rem 98
55 PRINT"{DOWN}{2 LEFT}[2 G]{DOWN}
   {2 LEFT}[2 G]":PRINTTAB(17)"L[G]{DOWN}
   {2 LEFT} [G]":RETURN                :rem 123
56 PRINT"{HOME}"TAB(7)"{8 DOWN}[M] {DOWN}
   {2 LEFT}[M]P{DOWN}{2 LEFT}[2 M]{DOWN}
   {2 LEFT}[2 M]{DOWN}{2 LEFT}[M]@{DOWN}
   {2 LEFT}[M] ":RETURN                :rem 205
57 PRINT"{HOME}":PRINTTAB(13)"{7 DOWN}
   [G]{DOWN}{2 LEFT}O[G]{DOWN}{2 LEFT}
   [2 G]{DOWN}{2 LEFT}[2 G]{DOWN}{2 LEFT}
   L[G]{DOWN}{2 LEFT} [G]":RETURN:rem 178
58 PRINT"{HOME} {DOWN}{LEFT}P{DOWN}{LEFT}
   [M]{DOWN}{LEFT}[M]{DOWN}{LEFT}[M]
   {DOWN}{LEFT}[M]{DOWN}{LEFT}[M]{DOWN}
   {LEFT}[M]{DOWN}{LEFT}[M]{DOWN}{LEFT}
   [M]{DOWN}{LEFT}[M]{DOWN}{LEFT}[M]
   {DOWN}{LEFT}[M]{DOWN}{LEFT}[M]{DOWN}
   {LEFT}[M]{DOWN}{LEFT}[M]{DOWN}{LEFT}
   [M]{DOWN}{LEFT}[M]{DOWN}{LEFT}[M]
   {DOWN}{LEFT}[M]{DOWN}{LEFT}@{DOWN}
   {LEFT} {HOME}"                      :rem 242
59 RETURN                               :rem 78
60 FORI=X+(2*GP)TOX+(21*GP)STEPGP:POKEI,1
   01:NEXT:POKEX,32                     :rem 67
61 POKEX+(1*GP),79:POKEX+(20*GP),76:POKEX
   +(21*GP),32:RETURN                   :rem 253
62 PRINT"{CLR}{2 SPACES}YOU ARE HERE":ZS=
   1                                    :rem 26
63 FORJ=1TO17:FORI=1TO17               :rem 246
64 IFM%(I,J)=1THENPRINT"{RVS} {OFF}";:GOT
   O68                                  :rem 169
65 IFI=BANDJ=CTHENPRINT"{CYN}Z{WHT}";:GOT
   O68                                  :rem 249
66 IFM%(I,J)=5THENPRINT"R";:GOTO68:rem 93
67 PRINT"{RIGHT}";                     :rem 150
68 NEXTI:PRINT"":NEXTJ                 :rem 196
69 IF ZSTHENZS=0:RETURN                 :rem 14
70 POKE198,0:PRINTO$:GOSUB73:CLR:GOTO1
                                        :rem 177
71 DATA2,2,2,3,2,4,4,2,4,4,4,3,16,14,16,1
   6,14,16,15,16,14,14,8,5,8,6,8,7
                                        :rem 209
72 DATA8,8,8,9,8,10,14,8,14,9,14,10,3,2,2
   ,5,5,2,12,10,10,10,6,6               :rem 23
73 GETA$:IFA$=""THEN73                 :rem 247
74 IFA$="Q"THENPOKE198,0:SYS198        :rem 104
75 PRINT"{CLR}":RETURN                 :rem 234
76 PRINTO$:WAIT198,1:POKE198,0:SYS198
                                        :rem 29
```

Programming Commodore's Magic Voice

(Article on page 161.)

Finger Talk

Note: This program is designed for use with a 64 equipped with the Magic Voice module.

```
10 DIM C$(10),EQ$(40),HO$(40),T$(20):GOTO
   80                                   :rem 189
20 FORI=1TO40:IFK$=HO$(I)THENK$=EQ$(I):I=
   40                                   :rem 36
30 NEXT:FORI=1TO3                       :rem 80
40 IFK$<>H1$(I)THEN60                  :rem 168
50 K$=E1$(I):SAYK$:T$(W)=K$:W=W+1:K$=E1$(
   I+3):I=3                             :rem 205
60 NEXT:RETURN                         :rem 191
```

```
70 FORI=ØTOW-1:SAYT$(I):NEXT:FORI=ØTOW-1:
   T$(I)="":NEXT:W=Ø:RETURN        :rem 155
8Ø POKE49457,76:POKE49458,174:POKE49459,1
   67:REM AVERT ILLEGAL QTY ERROR:rem 224
9Ø FORK=1TO1Ø:READC:C$(K)=CHR$(C):NEXT:RE
   M EDITING COMMANDS              :rem 162
1ØØ FORI=1TO4Ø:READHO$(I),EQ$(I):NEXT:REM
    HOMONYMNS & EQUIVALENTS        :rem 55
11Ø FORI=1TO3:READH1$(I):NEXT:FORI=1TO6:R
   EADE1$(I):NEXT:REM 2-PART EQUIVALENTS
                                   :rem 197
12Ø POKE53281,1:POKE5328Ø,6:POKE53272,23:
   REM SCREEN COLORS & LOWERCASE:rem 1Ø3
13Ø PRINT"{CLR}{8 DOWN}{7 RIGHT}{RVS}
   {RED}{7 RIGHT}FINGER TALK{8 RIGHT}"
                                   :rem 19
14Ø PRINT"{5 DOWN}":INPUT"{12 RIGHT}{RVS}
   {GRN}RATE (1-1Ø){RIGHT}{OFF}";RT$
                                   :rem 197
15Ø RT=VAL(RT$):IFRT<1ORRT>1ØTHEN13Ø
                                   :rem 252
16Ø PRINT "{4 DOWN}{PUR}{9 RIGHT}SAY EACH
    LETTER (Y/N) ?"                :rem 1
17Ø GETA$:IFA$=""ORA$<>"Y"ANDA$<>"N"THEN1
   7Ø                              :rem 18Ø
18Ø PL=-(A$="Y")                    :rem 47
19Ø GOSUB38Ø                       :rem 181
2ØØ PRINT"{P}{LEFT}";:RATE(RT):RT=(RT=1Ø)
   *1Ø+RT:POKE1Ø24,RT+48:POKE55296,Ø
                                   :rem 19Ø
21Ø GETA$:IFA$=""THEN21Ø            :rem 73
22Ø IFPOS(Ø)>78THENA$=CHR$(13)     :rem 2Ø2
23Ø PRINT" {LEFT}";:T=Ø:FORI=1TO1Ø:IFA$=C
   $(I)THENT=I:I=1Ø                :rem 171
24Ø NEXTI:IFT=3ORT=8THENPRINTC$(8):GOSUB3
   8Ø                              :rem 22
25Ø IFT=2ORT=4ORT=7THENPRINTA$;:IFT=4ANDL
   EN(K$)>ØTHENK$=MID$(K$,1,LEN(K$)-1)
                                   :rem 161
26Ø IFT<>ØTHEN2ØØ                  :rem 23Ø
27Ø IFA$=CHR$(133)THENRT=RT+1+(RT=1Ø)*1Ø:
   GOTO2ØØ                         :rem 23
28Ø IFA$>CHR$(192)ANDA$<CHR$(218)THENPRIN
   TA$;:A$=CHR$(ASC(A$)-128):GOTO36Ø
                                   :rem 6
29Ø IFA$<>CHR$(32)THEN32Ø          :rem 132
3ØØ IFK$=""THENPRINTA$;:GOTO2ØØ    :rem 115
31Ø GOSUB2Ø:PRINTA$;:SAYK$:T$(W)=K$:K$=""
   :W=W+1:GOTO2ØØ                  :rem 41
32Ø IFA$<>CHR$(13)THEN35Ø          :rem 128
33Ø IFK$=""THENPRINTA$;:GOSUB7Ø:GOTO2ØØ
                                   :rem 151
34Ø GOSUB2Ø:T$(W)=K$:K$="":W=W+1:PRINTA$;
   :GOSUB7Ø:GOTO2ØØ                :rem 183
35Ø PRINTA$;                       :rem 197
36Ø K$=K$+A$:IFPL=1THEN:SAYA$      :rem 21Ø
37Ø GOTO2ØØ                        :rem 1Ø1
38Ø PRINT"{CLR}{RVS}{GRN}{4 SPACES}LET YO
   UR {RED} FINGERS {CYN} DO THE {RED} T
   ALKING {OFF}{WHT}{BLU}":RETURN
                                   :rem 15Ø
39Ø DATA 17,18,19,2Ø,29,145,146,147,148,1
   57                              :rem 85
4ØØ REM 17=CD 18=RVS 19=HM 2Ø=DEL 29=CR 1
   45=CU 146=ROFF 147=CLR 148=INST 157=C
   L                               :rem 225
41Ø DATA AD,ADD,BEE,B,SEE,C,SEA,C,GEE,G,G
   RAY,GREY,EYE,I,INN,IN,JAY,J     :rem 139
42Ø DATA MOOR,MORE,KNOT,NOT,ORE,OR,OAR,OR
   ,PEA,P,QUEUE,Q,TEA,T,TEE,T,TIE,TY
                                   :rem 46
43Ø DATA EWE,U,EWES,USE,WEE,WE      :rem 97
44Ø DATA #,NUMBER,&,AND,',APOSTROPHE,*,TI
   MES,+,PLUS,-,MINUS              :rem 123
45Ø DATA Ø,ZERO,1,ONE,2,TWO,3,THREE,4,FOU
   R,5,FIVE,6,SIX,7,SEVEN,8,EIGHT:rem 83
46Ø DATA 9,NINE,=,EQUALS,?,QUESTION,@,AT
                                   :rem 223
47Ø DATA /,<,>,DIVIDED,LESS,MORE,BY,THAN,
   THAN                            :rem 18
```

Cassette Index

(Article on page 88.)

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs," "A Beginner's Guide To Typing In Programs," and "The Automatic Proofreader" that appear before the Program Listings.

```
1 SYS65517                          :rem 56
2 IFPEEK(781)=4ØTHENMT$="{WHT}":GOTO4
                                    :rem 153
3 MT$="{BLU}"                       :rem 152
4 PRINTMT$:PRINT"{CLR}{1Ø DOWN}{4 RIGHT}
   {RVS}CASSETTE INDEX"             :rem 4Ø
5 FORQ=1TO2ØØØ:NEXT                :rem 185
6 PRINT"{CLR}{2 DOWN}{3 RIGHT}{RVS}CASSET
   TE INDEX{OFF}":PRINT"{DOWN} TO USE THIS
    INDEX:"                        :rem 33
7 PRINT"{DOWN}{RIGHT}1 RESET CASSETTE"
                                    :rem 7Ø
8 PRINT"{3 SPACES}COUNTER TO ØØØ" :rem 92
9 PRINT"{DOWN}{RIGHT}2 FIND PROGRAM AND"
                                    :rem 118
1Ø PRINT"{3 SPACES}LOCATION"        :rem 139
11 PRINT"{5 SPACES}(NEXT PAGE)"     :rem 224
12 PRINT"{DOWN}{RIGHT}3 ADVANCE TAPE USIN
   G"                               :rem 55
13 PRINT"{3 SPACES}F.FWD, TO LOCATION"
                                    :rem 178
14 PRINT"{3 SPACES}DESIRED"         :rem 54
15 PRINT"{DOWN}{RIGHT}4 STOP TAPE & FOLLO
   W"                               :rem 2
16 PRINT"{3 SPACES}{RVS}LOAD{OFF} INSTRUC
   TIONS":PRINT"{DOWN} {RVS}PRESS A KEY T
   O BEGIN{OFF}"                    :rem 48
17 GETAN$:IFAN$=""GOTO17            :rem 153
18 PRINT"{CLR}{2 DOWN}{3 RIGHT}{RVS}CASSE
   TTE INDEX{OFF}":PRINT"{DOWN}THIS CASSE
   TTE HAS"                         :rem 74
19 PRINT"THE FOLLOWING PROGRAMS"    :rem 56
2Ø PRINT"AT THE APPROXIMATE":PRINT"COUNTE
   R READING SHOWN:{DOWN}"          :rem 242
21 READA$:READB$                    :rem 16Ø
22 PRINTA$TAB(14)B$                 :rem 73
23 FORX=1TO8                        :rem 237
24 READA$                           :rem 231
25 IFA$="-1"GOTO33                  :rem 217
26 READB$                           :rem 234
27 IFB$="-1"GOTO33                  :rem 22Ø
28 PRINTTAB(1)A$TAB(16)B$           :rem 17Ø
29 NEXTX                             :rem 2
3Ø PRINT:PRINT"PRESS KEY TO CONTINUE"
                                    :rem 121
31 GETP$:IFP$=""GOTO31              :rem 19
```

```
32 IFA$<>"-1"GOTO18:IFB$<>"-1"GOTO18
                                    :rem 4
33 PRINT:PRINT"{BLK}{2 SPACES}** END OF I
   NDEX **"MT$                     :rem 223
34 PRINT"{HOME}{20 DOWN}SHOW AGAIN (Y/N)"
   ;:INPUTAN$                      :rem 31
35 IFAN$="Y"THENGOTO38             :rem 87
36 IFAN$<>"N"THENGOTO34            :rem 134
37 END                             :rem 65
38 RESTORE:GOTO18                  :rem 107
39 DATAPROGRAM NAME,COUNTER,DUMMY NAME01,
   000,DUMMY NAME02,000,DUMMY NAME03,000
                                   :rem 240
40 DATADUMMY NAME04,000,DUMMY NAME05,000,
   DUMMY NAME06,000,DUMMY NAME07,000
                                   :rem 60
41 DATADUMMY NAME08,000,PROGRAM NAME,COUN
   TER,DUMMY NAME09,000,DUMMY NAME10,000
                                   :rem 245
42 DATADUMMY NAME11,000,DUMMY NAME12,000,
   DUMMY NAME13,000,DUMMY NAME14,000
                                   :rem 54
43 DATADUMMY NAME15,000,DUMMY NAME16,000,
   PROGRAM NAME,COUNTER,DUMMY NAME17,000
                                   :rem 250
44 DATADUMMY NAME18,000,DUMMY NAME19,000,
   DUMMY NAME20,000,DUMMY NAME21,000,-1
                                   :rem 204
```

Disk/Tape Backup

(Article on page 164.)

```
10 SYS65517:IFPEEK(781)=40THENMT$="{WHT}"
   :GOTO30                         :rem 56
20 MT$="{BLU}"                     :rem 199
30 GOSUB1580:IFBR$="R"THEN450      :rem 205
40 FORS1=K1TONF:GOSUB930           :rem 21
50 GET#FP,A$:A$=MID$(A$+C0$,K1,K1):ZT=ST
                                   :rem 253
60 BK=BK+K1:PRINT UP$;TAB(17);BK:R$=""
                                   :rem 184
70 GETI$:IFI$<>""GOTO330           :rem 119
80 LB$=A$:LB=ASC(LB$):NE=K1        :rem 33
90 IFZTTHENGOSUB150:GOSUB220:GOTO250
                                   :rem 67
100 GET#FP,A$:A$=MID$(A$+C0$,K1,K1):ZT=ST
                                   :rem 41
110 IFLEN(R$)>CMTHENGOSUB150:GOSUB220:GOT
    O60                             :rem 1
120 IFLB$<>A$THEN140               :rem 119
130 IFNE<250THENNE=NE+K1:GOTO90    :rem 158
140 GOSUB150:GOTO80                :rem 134
150 IFNE>K1GOTO190                 :rem 69
160 IFLB<CSTHENR$=R$+LB$:RETURN    :rem 213
170 IFLB<233 OR LB=245THENR$=R$+CHR$(230)
    +LB$:RETURN                    :rem 241
180 R$=R$+LB$:RETURN               :rem 185
190 IFLB=SPTHENR$=R$+CS$+CHR$(NE):RETURN
                                   :rem 254
200 IFLB=DATHENR$=R$+CHR$(245)+CHR$(NE):R
    ETURN                          :rem 11
210 R$=R$+CHR$(231)+CHR$(NE)+LB$:RETURN
                                   :rem 214
220 L$=MID$(STR$(LEN(R$)+K4),K2)   :rem 247
230 PRINT#1,MID$(L$+SP$,K1,K3);"D";R$;
                                   :rem 84
240 NB=NB+LEN(R$)+4:RETURN         :rem 61
250 GOSUB410:PRINT UP$;TAB(30);NB:rem 205
260 GOSUB2490:CLOSE FP             :rem 45
270 NEXTS1                         :rem 92
280 PRINT"TO RESTORE FILES LOAD THIS";
                                   :rem 56
290 PRINT" PROGRAM FROM THE BACKUP TAPE"
                                   :rem 121
300 GOSUB 860                      :rem 177
310 FORSL=K1TO20:NEXT              :rem 81
320 GOTO 2480                      :rem 156
330 PRINT"Q QUIT, SPACE CONTINUE":rem 248
340 GETI$:IFI$=""GOTO340           :rem 107
350 IFI$<>"Q"GOTO370               :rem 118
360 CLOSEFP:AN$="A":GOSUB410:GOTO2480
                                   :rem 228
370 PRINT UP$ "{23 SPACES}" UP$    :rem 253
380 PRINT CHR$(18) " P TO PAUSE" CHR$(146
    ) UP$:GOTO80                   :rem 41
390 PRINT#1,"024F";MID$(NA$+SP$,K1,16);MI
    D$(TY$,K1,K1);MID$(LN$+SP$,K1,K3);
                                   :rem 165
400 NB=NB+24:RETURN                :rem 156
410 PRINT#1,"005E";AN$:NB=NB+8:PRINT#1,C0
    $;C0$;C0$;:CLOSE1:RETURN       :rem 96
420 EN=LEN(DT$)                    :rem 82
430 IFASC(MID$(DT$,EN,1))<>160THENRETURN
                                   :rem 149
440 DT$=LEFT$(DT$,EN-K1):GOTO420   :rem 94
450 GOSUB1110                      :rem 220
460 FOR S1=K1TONF                  :rem 245
470 BK=K0:NA$=NA$(S1):TY$=TY$(S1):rem 128
480 OPEN 1,1,0:NB=NB+300:GOSUB840 :rem 99
490 FM$="":PRINT:PRINT UP$ CHR$(18) " FOU
    ND" CHR$(146) " ";             :rem 19
500 IFRC$<>"F"THENCLOSE1:GOTO480 :rem 198
510 FORX=K1TO16:GET#1,I$:FM$=FM$+I$:NEXT
                                   :rem 149
520 PRINT FM$:GET#1,A$,A$,A$,A$    :rem 141
530 IFFM$=NA$GOTO580               :rem 164
540 GOSUB840:IFRC$="N"THENCLOSE1:GOSUB152
    0:GOTO480                      :rem 109
550 NB=NB+LN:FORX=K1TOLN-K4:GET#K1,A$:NEX
    T:GOSUB840                     :rem 240
560 IFRC$="D"GOTO550               :rem 123
570 CLOSE1:GOTO480                  :rem 82
580 X=LEN(NA$):IFMID$(NA$,X,K1)=" "THENNA
    $=MID$(NA$,K1,X-K1):GOTO580    :rem 147
590 OPENFP,8,FP,"@0:"+NA$+CO$+TY$+",W"
                                   :rem 83
600 GOSUB840:IFRC$="D"GOTO640      :rem 204
610 IFRC$="E"GOTO760               :rem 123
620 IFRC$="N"THENGOSUB1510:GOTO470:rem 51
630 PRINT " EXPECTED D OR E":GOTO2480
                                   :rem 39
640 BK=BK+K1:PRINT UP$;TAB(24);BK:rem 185
650 L=0                            :rem 84
660 L=L+K1:IFL>LN-K4GOTO600        :rem 128
670 GET#1,A$:A$=MID$(A$+C0$,K1,K1):A=ASC(
    A$)                            :rem 73
680 IFA<230THENPRINT#FP,A$;:GOTO660
                                   :rem 143
690 IFA=230THENGET#1,A$:L=L+K1:A$=MID$(A$
    +C0$,K1,K1):PRINT#FP,A$;:GOTO660
                                   :rem 232
700 IFA=231THEN730                  :rem 3
710 IFA=232 OR A=245 THEN750       :rem 193
720 PRINT#FP,A$;:GOTO660           :rem 186
730 GET#1,A$,A1$:L=L+K2:A1$=MID$(A1$+C0$,
    K1,K1)                         :rem 220
740 FORX=K1TOASC(A$):PRINT#FP,A1$;:NEXT:G
    OTO660                         :rem 200
```

```
750 GET#1,A1$:L=L+K1:FORX=K1TOASC(A1$):PR
    INT#FP,CHR$(A-200);:NEXT:GOTO660
                                    :rem 156
760 GOSUB2490:CLOSE1:CLOSE FP       :rem 19
770 IF A$<>"A"GOTO820               :rem 100
780 PRINT " FILE'" NA$ "' IS INCOMPLETE
                                    :rem 63
790 PRINT"Q TO QUIT, SPACE TO CONTINUE
                                    :rem 38
800 GETA$:IFA$=""GOTO800            :rem 93
810 IFA$="Q"GOTO2480                :rem 102
820 NEXT S1:GOSUB860                :rem 181
830 FORSL=K1TO20:NEXT:GOTO2480      :rem 153
840 GET#1,L1$,L2$,L3$,RC$           :rem 31
850 LN=VAL(L1$+L2$+L3$):NB=NB+LN:RETURN
                                    :rem 90
860 TT=VAL(MID$(TI$,K1,K2))*3600+VAL(MID$
    (TI$,K3,K2))*60                 :rem 93
870 TT=TT+INT(NB/25):HH=INT(TT/3600)
                                    :rem 156
880 MM=INT((TT-HH*3600)/60)         :rem 241
890 HH$=MID$(STR$(HH),2):IFLEN(HH$)<2THEN
    HH$="0"+HH$                     :rem 203
900 MM$=MID$(STR$(MM),2):IFLEN(MM$)<2THEN
    MM$="0"+MM$                     :rem 245
910 TI$=HH$+MM$+"00":PRINT "ESTIMATED TIM
    E=";TI$                         :rem 23
920 RETURN                          :rem 123
930 NA$=NA$(S1):TY$=TY$(S1)          :rem 2
940 IFNB+LN(S1)*(BD+5)+BH<TB GOTO1050
                                    :rem 61
950 OPEN 1,1,1,NA$:GOSUB390         :rem 240
960 PRINT#1,"004N";:CLOSE1          :rem 238
970 PRINT " LOAD ANOTHER CASSETTE"
                                    :rem 254
980 PRINT "{3 SPACES}TYPE Q TO QUIT,"
                                    :rem 23
990 PRINT "{2 SPACES}SPACE TO CONTINUE"
                                    :rem 231
1000 GETA$:IF A$="" THEN1000        :rem 165
1010 IF A$="Q" GOTO2480             :rem 143
1020 PRINT " TAPE SIZE (MIN) ";TM;MID$(BS
     $,1,LEN(STR$(TM))+2);          :rem 173
1030 INPUT TM$:IFTM$=""THENTM$=STR$(TM)
                                    :rem 104
1040 TB=VAL(TM$)*BM:GOSUB860:NB=K0:rem 36
1050 PRINT SP$;CR$                   :rem 14
1060 PRINT"{4 SPACES}{UP}{RVS}P TO PAUSE
     {OFF}":PRINTUP$ UP$            :rem 151
1070 PRINTNA$:BK=K0                 :rem 135
1080 LN$=MID$(STR$(LN(S1)),K2)      :rem 153
1090 OPEN FP,8,FP,"0:"+NA$+CO$+TY$+",R"
                                    :rem 58
1100 OPEN 1,1,1,NA$:NB=NB+BH:GOSUB390:RET
     URN                            :rem 122
1110 PRINT "{DOWN} FORMAT DISK (N OR Y)"
                                    :rem 50
1120 INPUT" ";A$                    :rem 56
1130 IFA$<>"Y"GOTO1200              :rem 204
1140 ND$="":PRINT "{DOWN} DISK NAME";
                                    :rem 160
1150 INPUTND$:IFND$=""GOTO1200       :rem 9
1160 ID$="":PRINT " DISK ID{2 SPACES}";
                                    :rem 248
1170 INPUTID$:IFID$=""GOTO1200       :rem 1
1180 PRINT#15,"N0:";ND$;",";ID$     :rem 144
1190 GOSUB 2490:IFE1THEN2490        :rem 87
1200 PRINT " OPEN DTB.ID.FILE"      :rem 169
1210 OPEN 1,1,0,"DTB.ID.FILE"        :rem 51
1220 NB=NB+300                      :rem 224
1230 GOSUB840                       :rem 226
1240 GET#1,A$                       :rem 140
1250 IFA$<>VN$ THENPRINT " VERSION ERROR"
     :GOTO2480                      :rem 239
1260 PRINT "{CLR}{DOWN} FROM DISK:";
                                    :rem 18
1270 FORX=1TO20:GET#1,A$:PRINT A$;:NEXT
                                    :rem 91
1280 PRINT:PRINT "BACKED UP ON{2 SPACES}D
     ATE:";                         :rem 210
1290 FORX=1TO8 :GET#1,A$:PRINT A$;:NEXT
                                    :rem 51
1300 PRINT " TIME:";                 :rem 57
1310 FORX=1TO6 :GET#1,A$:PRINT A$;:NEXT
                                    :rem 42
1320 PRINT                          :rem 83
1330 NF=0                           :rem 200
1340 GOSUB840                       :rem 228
1350 IFRC$="F" THEN1380             :rem 211
1360 IFRC$="E" THEN CLOSE1:RETURN:rem 200
1370 PRINT " REC CD ERROR":GOTO2480
                                    :rem 200
1380 NA$="":FORX=1TO16:GET#1,A$:PRINTA$;
                                    :rem 87
1390 NA$=NA$+A$:NEXT                :rem 121
1400 GET#1,TY$:PRINT" "TY$" ";       :rem 81
1410 GET#1,A$,A2$,A3$:PRINT A$;A2$;A3$;
                                    :rem 30
1420 PRINT:IFAF$="Y"THEN1480        :rem 158
1430 PRINT UP$:PRINT"BKUP Y OR N";
                                    :rem 222
1440 YN$="":INPUT YN$               :rem 170
1450 IFMID$(YN$+"Y",K1,K1)="Y"GOTO1480
                                    :rem 107
1460 IF YN$="N"GOTO1340             :rem 245
1470 GOTO1430                       :rem 205
1480 NF=NF+K1                       :rem 217
1490 NA$(NF)=NA$:TY$(NF)=TY$:GOTO1340
                                    :rem 143
1500 RETURN                         :rem 166
1510 CLOSEFP:CLOSE1                 :rem 180
1520 PRINT" LOAD CONTINUATION TAPE"
                                    :rem 126
1530 PRINT" TYPE Q TO QUIT"          :rem 19
1540 PRINT"{6 SPACES}SPACE TO CONTINUE"
                                    :rem 15
1550 GETA$:IFA$=""GOTO1550          :rem 195
1560 IFA$="Q"GOTO2480               :rem 153
1570 GOSUB860:NB=0:RETURN            :rem 60
1580 DIM LN(150),NA$(150),T$(4),TY$(150)
                                    :rem 252
1590 BH=300:BD=256:BK=0:BM=840:BO=53280:C
     M=250:CS=230:DA=45:DIR=8:FP=5:rem 24
1600 K0=0:K1=1:K2=2:K3=3:K4=4        :rem 75
1610 NB=0:NC=0:NE=0:NF=0:PS=8000:SP=32:TB
     =0:TM=60                       :rem 142
1620 AF$="":AN$="N":BR$="":FORX=1TO40:BS$
     =BS$+CHR$(157):NEXT            :rem 142
1630 C0$=CHR$(0):CB$="":CO$=",":CS$=CHR$(
     232)                           :rem 59
1640 DA$="":DN$="":FM$="":RC$="":SP$="
     {9 SPACES}":SP$=SP$+SP$+SP$:UP$=CHR$
     (145)                          :rem 227
1650 VN$="2"                         :rem 71
1660 OPEN15,8,15:POKE BO,0          :rem 177
1670 PRINTMT$:PRINTCHR$(147):PRINT"
     {2 SPACES}DISK TO TAPE BACKUP
     {2 DOWN}"                      :rem 176
1680 T$(K0)="DEL":T$(1)="SEQ":T$(2)="PRG"
     :T$(3)="USR":T$(4)="REL"       :rem 242
1690 PRINT"BACKUP OR RESTORE":INPUT"(B OR
      R)";BR$                       :rem 163
```

```
1700 BR$=MID$(BR$+" ",1,1)          :rem 237
1710 IF BR$<>"B" AND BR$<>"R" GOTO2480
                                    :rem 178
1720 PRINT"{DOWN}PROCESS ALL FILES":INPUT
     "(Y OR N)";AF$                 :rem 164
1730 AF$=MID$(AF$+"Y",1,1)          :rem 47
1740 IF AF$<>"Y" AND AF$<>"N" GOTO2480
                                    :rem 174
1750 IF BR$="R"THEN1890             :rem 232
1760 PRINT "{DOWN}TAPE SIZE (MIN) ";TM;MI
     D$(BS$,1,LEN(STR$(TM))+2);     :rem 201
1770 INPUT TM$:IFTM$=""THENTM$=STR$(TM)
                                    :rem 115
1780 TM=VAL(TM$):TB=TM*BM           :rem 14
1790 OPEN 3,8,3,"0:SYS DATE,S,R"    :rem 237
1800 INPUT#15,E1,E2$,E3,E4          :rem 148
1810 IF E1 THEN D$="00/00/00":GOTO1830
                                    :rem 164
1820 INPUT#3,D$                     :rem 69
1830 CLOSE3                         :rem 117
1840 PRINT "{DOWN} MM/DD/YY ";      :rem 28
1850 INPUT DA$:IF DA$="" THEN DA$=D$
                                    :rem 119
1860 IF D$=DA$ GOTO1890             :rem 183
1870 DA$=MID$(DA$+"{8 SPACES}",1,8):OPEN
     {SPACE}3,8,3,"@0:SYS DATE,S,W":
                                    :rem 179
1880 GOSUB2490:PRINT#3,DA$:CLOSE3:rem 245
1890 T$=TI$                         :rem 72
1900 PRINT "{DOWN} HHMM{5 SPACES}? "T$;MI
     D$(BS$,1,LEN(T$)+2);           :rem 153
1910 INPUT T$:TI$=MID$(T$+"000000",1,6)
                                    :rem 32
1920 IF BR$="R"THENRETURN           :rem 245
1930 PRINT"{CLR}{2 SPACES}READING DIRECTO
     RY{DOWN}":OPEN DIR,8,DIR,"$"   :rem 63
1940 FOR L=K1 TO 142:GET#DIR,A$:NEXT
                                    :rem 26
1950 DN$="":FORL=K1TO16:GET#DIR,A$
                                    :rem 227
1960 DN$=DN$+A$:NEXT:PRINT "{CLR} DISK:"D
     N$;                            :rem 118
1970 DT$=DN$:GOSUB420:DN$=DT$       :rem 185
1980 GET#DIR,A$,A$,I1$,I2$,A$,O1$,O2$
                                    :rem 157
1990 PRINT" ID:";I1$;I2$;:PRINT" OS:";O1$
     ;O2$"{DOWN}"                   :rem 84
2000 FOR L=K1TO89:GET#DIR,A$:NEXT:rem 232
2010 NF=0                           :rem 196
2020 RB=DIR:R$=""                   :rem 165
2030 FORR=K1TO254:GET#RB,A$:R$=R$+MID$(A$
     +C0$,K1,K1):NEXT:ZS=ST         :rem 239
2040 B=K0                           :rem 192
2050 PRINT"{CLR} DISK:"DN$;         :rem 129
2060 PRINTTAB(23)"ID:";I1$;I2$;:PRINT" OS
     :";O1$;O2$"{DOWN}"             :rem 214
2070 FOR P=K1 TO 8                  :rem 148
2080 T=ASC(MID$(R$,B+K1)):IFT=K0THENT=128
                                    :rem 141
2090 L=ASC(MID$(R$,B+29)):H=ASC(MID$(R$,B
     +30))                          :rem 237
2100 L=(L+256*H):IFL=K0THEN2200     :rem 227
2110 N$=MID$(R$,B+K4,16)            :rem 227
2120 TY$=T$(T-128):IF TY$="DEL"THEN2200
                                    :rem 155
2130 DT$=N$:GOSUB420:N$=DT$         :rem 38
2140 PRINT L;TAB(4);TY$;"{2 SPACES}";N$
                                    :rem 111
2150 IFAF$="Y" THEN PRINT:GOTO2180
                                    :rem 214
2160 PRINT" Y/N ? Y";MID$(BS$,1,3);
                                    :rem 66
2170 YN$="":INPUTYN$:IFYN$="N"GOTO2200
                                    :rem 11
2180 NF=NF+K1:NA$(NF)=N$            :rem 88
2190 TY$(NF)=MID$(TY$,K1,K1):LN(NF)=L
                                    :rem 113
2200 B=B+32:NEXT P:PRINT"{DOWN}{2 SPACES}
     PLEASE WAIT..."                :rem 115
2210 IF ZS=K0 THEN2020              :rem 172
2220 CLOSE DIR                      :rem 27
2230 IF NF<K2THEN2360               :rem 157
2240 FORI=1TO2000:NEXT:PRINT "{CLR}{DOWN}
     {5 SPACES}SORTING ....{DOWN}"
                                    :rem 226
2250 FORS1=K1TONF-K1:SM=S1          :rem 104
2260 FORS2=S1+K1TONF                :rem 213
2270 IF NA$(SM)>NA$(S2)THENSM=S2    :rem 86
2280 NEXTS2                         :rem 144
2290 IFSM=S1THEN2330                :rem 180
2300 NA$(K0)=NA$(S1):NA$(S1)=NA$(SM):NA$(
     SM)=NA$(0)                     :rem 251
2310 TY$(K0)=TY$(S1):TY$(S1)=TY$(SM):TY$(
     SM)=TY$(0)                     :rem 176
2320 LN(K0)=LN(S1):LN(S1)=LN(SM):LN(SM)=L
     N(0)                           :rem 103
2330 PRINT " " NA$(S1)              :rem 33
2340 NEXTS1:PRINT" "NA$(NF):PRINT:rem 246
2350 GOSUB 2520:NB=NB+PS            :rem 120
2360 OPEN 1,1,1,"DTB.ID.FILE"       :rem 59
2370 NB=NB+BH+39                    :rem 117
2380 PRINT#1,"039V";VN$;            :rem 78
2390 PRINT#1,MID$(DN$+SP$,K1,20);   :rem 67
2400 PRINT#1,MID$(DA$+SP$,K1,8);TI$;
                                    :rem 0
2410 FORS1=K1TONF                   :rem 34
2420 LN$=MID$(STR$(LN(S1)),K2)      :rem 152
2430 NA$=NA$(S1):TY$=TY$(S1)        :rem 47
2440 GOSUB390                       :rem 230
2450 NEXTS1:GOSUB 410               :rem 221
2460 IF NF<K1GOTO2480               :rem 174
2470 RETURN                         :rem 173
2480 CLOSE15:END                    :rem 187
2490 INPUT#15,E1,E2$,E3,E4:IFE1THENPRINTE
     1;E2$;E3;E4                    :rem 72
2500 RETURN                         :rem 167
2510 END                            :rem 159
2520 SAVE"DTB":RETURN               :rem 48
2530 SAVE"@0:DTB",8                 :rem 37
```

Word Guess

(Article on page 66.)

BEFORE TYPING...

Before typing in programs, please refer to "How To Type COMPUTE!'s Gazette Programs," "A Beginner's Guide To Typing In Programs," and "The Automatic Proofreader" that appear before the Program Listings.

Program 1:
Word Guess—64 Version

```
9 N=100:GT=30                       :rem 202
10 GOSUB877                         :rem 135
```

```
15 POKE53280,2:POKE53281,1:PRINT"{CLR}{7
   "                                  :rem 246
17 V=54296:W=54276:A=54277:H=54273:L=5427
   2:S=54278                          :rem 251
20 DIM LE$(10),MI$(15),DI$(10),WU(N),WD$(
   N),AL$(27)                         :rem 103
25 FORI=1TON:READWD$(I):WU(I)=0:NEXT
                                      :rem 11
26 FORI=1TO27:READAL$(I):NEXT         :rem 44
28 GOSUB503                           :rem 130
30 RN=INT(N*RND(1))+1                 :rem 182
35 IFWU(RN)=1THEN110                  :rem 195
40 WU(RN)=1                           :rem 111
50 LN=LEN(WD$(RN))                    :rem 28
55 FORI=1TOLN:GN$=MID$(WD$(RN),I,1):LE$(I
   )=GN$:NEXT                         :rem 62
80 PRINT"{CLR}{2 DOWN}";TAB(13);"GUESS TH
   IS WORD"                           :rem 47
85 V1=1205-LN:V2=1285-LN              :rem 86
90 FORI=1TOLN:POKEV1,32:POKEV2,67:POKEV1+
   L,0:POKEV2+L,0:V1=V1+2:V2=V2+2:NEXT
                                      :rem 21
102 PRINT"{HOME}{7 DOWN}ENTER YOUR GUESS
    {SPACE}"                          :rem 66
104 PRINT"{HOME}{10 DOWN}LETTERS GUESSED
    {SPACE}SO FAR:"                   :rem 11
106 IT=TI/60                          :rem 163
107 TL=TI:TV=TL-60:TU=GT*60           :rem 177
108 GETGS$:IFGS$<>""THEN112           :rem 63
109 GOSUB310:IFTU=0THENGS$=CHR$(45):GOTO1
    15                                :rem 124
110 IFGS$=""THEN108                    :rem 40
112 IFLEN(GS$)>1THEN108                :rem 72
113 IFASC(GS$)<65ORASC(GS$)>90THEN108
                                      :rem 167
115 GU=GU+1                           :rem 104
120 MI$(GU)=GS$                        :rem 53
125 FORI=1TOLN                        :rem 115
130 IFLE$(I)=DI$(I)THEN145            :rem 195
140 IFGS$=LE$(I)THENDI$(I)=GS$:GOSUB610
                                      :rem 52
145 NEXTI                             :rem 34
160 FORJ=1TO27                        :rem 66
170 IFMI$(GU)=AL$(J)THEN177           :rem 37
173 NEXTJ                             :rem 36
177 V3=1525-LN-5+GU*2-2               :rem 221
178 IFJ=27THENJ=45                     :rem 62
180 POKEV3,J:POKEV3+L,0               :rem 140
185 GL=0:GL=LN+5-GU                   :rem 107
190 PRINT"{HOME}{15 DOWN}GUESSES LEFT:
    {8 SPACES}{6 LEFT}";GL            :rem 125
195 AG=1                              :rem 149
200 FORI=1TOLN:IFDI$(I)<>LE$(I)THENAG=0
                                      :rem 110
202 NEXTI                              :rem 28
204 IFAG=0ANDGL>0THEN107              :rem 181
206 ET=TI/60:FT=INT(ET-IT):TM=INT(FT/60):
    TS=FT-(TM*60)                     :rem 58
208 BA$=STR$(TS):SA$=MID$(BA$,2,2)
                                      :rem 116
210 IFTS<10THENSA$="0"+MID$(BA$,2,1)
                                      :rem 218
214 PRINT"{HOME}{15 DOWN}";TAB(20);"GUESS
     TIME";TM;CHR$(58);SA$            :rem 61
215 IFGL=0ANDAG=0THENGOSUB705         :rem 58
220 IFAG=1THENGOSUB810                :rem 97
225 PRINT"{HOME}{21 DOWN}{BLK}F3 TO QUIT"
                                      :rem 209
230 PRINT"F5 TO GO TO A DIFFERENT WORD{7
    "                                 :rem 107
235 GETAC$:IFAC$=""THEN235            :rem 221
240 IFAC$="{F5}"THEN28                :rem 110
245 IFAC$="{F3}"THEN PRINT"{CLR}":END
                                      :rem 125
250 GOTO235                           :rem 106
310 TV=TV+60                          :rem 182
320 TM=TI-TV                          :rem 231
330 IFTM<60THEN320                     :rem 44
340 TU=(GT*60-TV+TL)/60                :rem 48
350 B$=STR$(TU)                        :rem 82
360 S$=MID$(B$,2,2)                   :rem 190
370 IFTU<10THENS$="0"+MID$(B$,2,1):rem 97
380 PRINT"{HOME}{7 DOWN}";TAB(24);"TIME :
    ";S$                              :rem 89
390 RETURN                            :rem 124
503 SP$=" "                           :rem 224
505 FORI=1TO10:LE$(I)=SP$:MI$(I)=SP$:DI$(
    I)=SP$:PK(I)=32:PM(I)=32:NEXT:rem 129
510 FORI=11TO15:MI$(I)=SP$:NEXT       :rem 121
530 GU=0                              :rem 161
540 RETURN                            :rem 121
610 FORJ=1TO26                         :rem 65
620 IFDI$(I)=AL$(J)THEN625            :rem 199
623 NEXTJ                              :rem 36
625 V1=1205-LN+I*2-2                   :rem 31
630 POKEV1,J:POKEVI+L,0               :rem 160
635 POKEV,15:POKEW,33:POKEA,32:POKES,240
                                      :rem 192
640 FORT=1TO10:POKEH,68:POKEL,149:NEXT
                                      :rem 138
645 POKEH,0:POKEL,0:POKEW,0           :rem 159
650 FORT=1TO150:NEXT                  :rem 246
655 RETURN                            :rem 128
705 PRINT"{HOME}{18 DOWN}{8 SPACES}SORRY,
     YOU MISSED THE WORD"             :rem 92
710 PRINT"{8 SPACES}IT WAS ";WD$(RN)
                                      :rem 220
715 POKEV,15:POKEW,33:POKEA,32:POKES,240
                                      :rem 191
720 FORT=1TO200:POKEH,6:POKEL,16:NEXT
                                      :rem 75
725 POKEH,0:POKEL,0:POKEW,0           :rem 158
730 RETURN                            :rem 122
810 PRINT"{HOME}{18 DOWN}{8 SPACES}*** CO
    NGRATULATIONS ***"                 :rem 40
815 POKEV,15:POKEW,33:POKEA,32:POKES,240
                                      :rem 192
820 FORT=1TO25:POKEH,68:POKEL,149:NEXT
                                      :rem 144
825 POKEH,0:POKEL,0                   :rem 131
830 FORT=1TO100:POKEH,68:POKEL,149:NEXT
                                      :rem 187
835 POKEH,0:POKEL,0:POKEW,0           :rem 160
850 RETURN                            :rem 125
877 POKE53281,15:POKE53280,10          :rem 98
880 PRINT"{CLR}{8 DOWN}{10 SPACES}{BLK}W
    {SPACE}O R D - G U E S S"          :rem 12
890 PRINT:PRINT:PRINT"{10 SPACES}INSTRUCT
    IONS (Y/N)"                       :rem 220
895 GETAB$:IFAB$=""THEN895            :rem 243
897 IFAB$<>"Y"THEN975                 :rem 201
905 POKE53281,13:POKE53280,3           :rem 42
910 PRINTCHR$(144);"{CLR}{15 SPACES}WORD-
    GUESS":PRINT                      :rem 219
915 PRINT"{3 SPACES}THE OBJECT OF WORD-GU
    ESS IS TO DE-"                    :rem 130
920 PRINT"TERMINE THE LETTERS THAT MAKE U
    P A WORD."                         :rem 35
922 PRINT"{3 SPACES}THE WORD CAN BE UP TO
     10 CHARACTERS"                   :rem 109
924 PRINT"LONG.{2 SPACES}YOU HAVE 5 MORE
```

```
    {SPACE}GUESSES THAN THE"      :rem 130
926 PRINT"LENGTH OF THE WORD TO DETERMINE
     ALL THE"                     :rem 224
928 PRINT"LETTERS."               :rem 197
932 PRINT"{3 SPACES}YOU HAVE";GT;"SECONDS
     TO MAKE A GUESS."            :rem 171
934 PRINT"IF THE LETTER IS IN THE WORD, I
    T WILL"                       :rem 2
936 PRINT"SHOW IN ITS PROPER SLOT. ALL LE
    TTERS"                        :rem 127
938 PRINT"USED WILL BE DISPLAYED FOR REFE
    RENCE."                       :rem 168
940 PRINT"{3 SPACES}MULTIPLE OCCURENCES O
    F THE SAME"                   :rem 96
942 PRINT"LETTER WILL BE SHOWN IN ALL APP
    ROPRIATE"                     :rem 69
944 PRINT"SLOTS.":PRINT           :rem 252
946 PRINT"{3 SPACES}AFTER GUESSING A WORD
    , PRESS:"                     :rem 187
948 PRINT"{5 SPACES}{RVS}F3{OFF} TO QUIT"
    :PRINTTAB(8)"OR"              :rem 133
950 PRINT"{5 SPACES}{RVS}F5{OFF} TO GUESS
     ANOTHER WORD"                :rem 5
952 PRINT:PRINTTAB(15);"GOOD LUCK!"
                                  :rem 122
954 PRINTTAB(8);"PRESS ANY KEY TO START"
                                  :rem 157
956 GETAD$:IFAD$=""THEN956        :rem 243
975 RETURN                        :rem 133
1000 DATA DEGREE,DIVISION,SCROD,NAIVE,THI
     NKER                         :rem 159
1005 DATA WATER,LIGHT,REGIME,REVAMP,HYMN
                                  :rem 75
1010 DATA REGENCY,SYMPATHY,COUPON,PLANT,S
     POTLIGHT                     :rem 41
1015 DATA EXPRESS,AARDVARK,RUBBER,EMINENC
     E,BOOMERANG                  :rem 167
1020 DATA POETIC,EARTHQUAKE,MAIL,PARALYZE
     ,HEAT                        :rem 233
1025 DATA LAPSE,NITROGEN,GLASS,IDIOT,MEMO
     RY                           :rem 57
1030 DATA FLOWER,COMPUTER,LANDMARK,MESSAG
     E,CLARITY                    :rem 51
1035 DATA AMAZING,HARMONY,GALLON,JELLYFIS
     H,FLAME                      :rem 132
1040 DATA ENVIOUS,DOORBELL,DESTINY,DAISY,
     CORSAGE                      :rem 169
1045 DATA CANARY,BOYCOTT,OFFER,BENEFICIAL
     ,ARMADILLO                   :rem 63
1050 DATA ANGELIC,MONTH,BALMY,MARGARINE,L
     ODGE                         :rem 127
1055 DATA ORIGINAL,OXYGEN,SKIING,PLASMA,P
     REMATURE                     :rem 252
1060 DATA SPECIAL,REGARD,REFUGEE,SHAKE,WA
     TERCRESS                     :rem 185
1065 DATA SALOON,WASHABLE,WHATEVER,YOLK,W
     INDOW                        :rem 38
1070 DATA ACTION,ZENITH,YELLOW,TRICYCLE,Y
     AM                           :rem 68
1075 DATA FETCH,PRICE,CHEMICAL,DOWNWIND,H
     IBERNATE                     :rem 166
1080 DATA COUNTERACT,CLOVERLEAF,EARTHQUAK
     E,FLEXIBLE,QUEEN             :rem 34
1085 DATA PRECEDENT,ORANGE,CONSTRUCT,UNIC
     ORN,IMPORTANT                :rem 143
1090 DATA MEDALIST,YOURSELF,NOVICE,GEOGRA
     PHY,EXPENSIVE                :rem 129
1100 DATA MONITOR,HEADACHE,TELEVISION,TAX
     ,LANGUAGE                    :rem 10
2000 DATA A,B,C,D,E,F,G,H,I,J,K,L,M
                                  :rem 135
2010 DATA N,O,P,Q,R,S,T,U,V,W,X,Y,Z,-
                                  :rem 138
```

Program 2: Word Guess—VIC Version

Note: 8K or more expansion required.

```
9 N=100:GT=30                     :rem 202
10 GOSUB880                       :rem 129
15 POKE36879,26:PRINT"{CLR}"      :rem 216
17 V=36878:H=36876:L=33792        :rem 163
20 DIMLE$(10),MI$(15),DI$(10),WU(N),WD$(N
    ),AL$(27)                     :rem 103
25 FORI=1TON:READ WD$(I):WU(I)=0:NEXT
                                  :rem 11
26 FORI=1TO27:READ AL$(I):NEXT    :rem 44
28 GOSUB503                       :rem 130
30 RN=INT(N*RND(1))+1             :rem 182
35 IF WU(RN)=1 THEN 110           :rem 195
40 WU(RN)=1                       :rem 111
50 LN=LEN(WD$(RN)):REM FIND LENGTH OF WOR
    D                             :rem 238
55 FOR I=1TOLN:GN$=MID$(WD$(RN),I,1):LE$(
    I)=GN$:NEXT                   :rem 62
80 PRINT "{CLR}{2 DOWN}{BLU}{4 SPACES}GUE
    SS THIS WORD"                 :rem 8
85 V1=4196-LN:V2=4240-LN          :rem 92
90 FOR I=1TOLN:POKEV1,32:POKEV2,67:POKEV1
    +L,0:POKEV2+L,0:V1=V1+2:V2=V2+2:NEXT
                                  :rem 21
102 PRINT "{HOME}{8 DOWN}ENTER YOUR GUESS
     "                            :rem 83
104 PRINT "{HOME}{11 DOWN}LETTERS GUESSED
     SO FAR:"                     :rem 28
106 IT=TI/60                      :rem 163
107 TL=TI:TV=TL-60:TU=GT*60       :rem 177
108 GET GS$:IF GS$<>""THEN 112    :rem 63
109 GOSUB310:IFTU=0THENGS$=CHR$(45):GOTO1
    15                            :rem 124
110 IF GS$=""THEN 108             :rem 40
112 IF LEN(GS$)>1 THEN 108        :rem 72
113 IF ASC(GS$)<65 OR ASC(GS$)>90 THEN 10
    8                             :rem 167
115 GU=GU+1                       :rem 104
120 MI$(GU)=GS$                   :rem 53
125 FOR I=1TOLN                   :rem 115
130 IF LE$(I)=DI$(I) THEN 145     :rem 195
140 IFGS$=LE$(I)THENDI$(I)=GS$:GOSUB610
                                  :rem 52
145 NEXT I                        :rem 34
160 FOR J = 1 TO 27               :rem 66
170 IF MI$(GU)=AL$(J) THEN 177    :rem 37
173 NEXT J                        :rem 36
177 V3=4375-LN-5+GU*2-2           :rem 227
178 IF J=27 THEN J=45:REM POKE POSITION F
    OR DASH                       :rem 7
180 POKEV3,J:POKEV3+L,0           :rem 140
185 GL=0:GL=LN+5-GU               :rem 107
190 PRINT "{HOME}{15 DOWN}GUESSES LEFT:
    {8 SPACES}{6 LEFT}";GL        :rem 125
195 AG=1                          :rem 149
200 FOR I=1TOLN:IFDI$(I)<>LE$(I)THENAG=0
                                  :rem 110
202 NEXT I                        :rem 28
204 IF AG=0 AND GL>0 THEN 107     :rem 181
206 ET=TI/60:FT=INT(ET-IT):TM=INT(FT/60):
    TS=FT-(TM*60)                 :rem 58
208 BA$=STR$(TS):SA$=MID$(BA$,2,2)
                                  :rem 116
210 IF TS<10THENSA$="0"+MID$(BA$,2,1)
                                  :rem 218
214 PRINT"{HOME}{19 DOWN}{3 SPACES}GUESS
```

```
    {SPACE}TIME";TM":"SA$          :rem 134
215 IFGL=ØANDAG=ØTHENGOSUB705      :rem 58
220 IFAG=1THENGOSUB810             :rem 97
225 PRINT "{HOME}{21 DOWN}{BLK}{6 SPACES}
    {RVS}F3{OFF} TO QUIT"          :rem 117
230 PRINT "{4 SPACES}{RVS}F5{OFF} ANOTHER
     WORD";:POKE198,Ø              :rem 116
235 GET AC$:IF AC$="" THEN 235     :rem 221
240 IF AC$="{F5}" THEN 28          :rem 110
245 IF AC$="{F3}" THEN PRINT "{CLR}"
                                   :rem 108
250 END                            :rem 110
310 TV=TV+60                       :rem 182
320 TM=TI-TV                       :rem 231
330 IF TM<60 THEN320               :rem 44
340 TU=(GT*60-TV+TL)/60            :rem 48
350 B$=STR$(TU)                    :rem 82
360 S$=MID$(B$,2,2)                :rem 190
370 IF TU<10 THENS$="Ø"+MID$(B$,2,1)
                                   :rem 97
380 PRINT "{HOME}{19 DOWN}";TAB(6);"TIME
    {SPACE}: ";S$                  :rem 245
390 RETURN                         :rem 124
503 SP$=" "                        :rem 224
505 FOR I = 1TO10:LE$(I)=SP$:MI$(I)=SP$:D
    I$(I)=SP$:PK(I)=32:PM(I)=32:NEXT
                                   :rem 129
510 FOR I=11TO15:MI$(I)=SP$:NEXT   :rem 121
530 GU=Ø                           :rem 161
540 RETURN                         :rem 121
610 FOR J=1 TO 26                  :rem 65
620 IF DI$(I)=AL$(J)THEN 625       :rem 199
623 NEXT J                         :rem 36
625 V1=4196-LN+I*2-2               :rem 43
630 POKE V1,J:POKEVI+L,Ø           :rem 160
635 POKEV,15                       :rem 181
640 FORT=1TO10:POKEH,218:NEXT      :rem 56
645 POKEH,Ø                        :rem 114
650 FORT=1TO150:NEXT               :rem 246
655 RETURN                         :rem 128
705 PRINT "{HOME}{15 DOWN} SORRY, THE WOR
    D WAS"                         :rem 82
710 PRINT"{DOWN}{7 SPACES}{RVS}";WD$(RN)"
    {OFF}"                         :rem 77
715 POKE V,15                      :rem 180
720 FORT=1TO200:POKEH,140:NEXT     :rem 98
725 POKE H,Ø                       :rem 113
730 RETURN                         :rem 122
810 PRINT "{HOME}{15 DOWN} **CONGRATULATI
    ONS**"                         :rem 161
815 POKEV,15                       :rem 181
820 FORVV=1TO2:FORT=1TO25:POKEH,210:NEXT
                                   :rem 70
825 POKEH,Ø:NEXT                   :rem 235
830 FORT=1TO100:POKEH,230:NEXT     :rem 99
835 POKEH,Ø                        :rem 115
850 RETURN                         :rem 125
880 PRINT"{CLR}{8 DOWN}{2 SPACES}W O R D
    {SPACE}- G U E S S"            :rem 124
890 PRINT:PRINT:PRINT"{2 SPACES}{DOWN}INS
    TRUCTIONS? (Y-N)"              :rem 42
895 GETAB$:IFAB$=""THEN895         :rem 243
897 IFAB$<>"Y"THEN990              :rem 198
910 PRINTCHR$(144);"{CLR}":PRINT   :rem 235
915 PRINT"{3 SPACES}THE OBJECT OF WORD GU
    ESS IS TO DETERMINE THE LETTERS THAT
    {SPACE}MAKE"                   :rem 143
920 PRINT"UP A WORD. THE WORD{3 SPACES}CA
    N BE UP TO 10{7 SPACES}LETTERS LONG.
    {SPACE}YOU HAVE";              :rem 184
922 PRINT"5 MORE GUESSES THAN{3 SPACES}TH
    E LENGTH OF THE WORDTO DETERMINE ALL
    {SPACE}THE"                    :rem 111
924 PRINT"LETTERS. YOU HAVE";GT    :rem 184
926 PRINT"SECONDS TO MAKE A{5 SPACES}GUES
    S. IF THE LETTER"              :rem 120
927 PRINT"IS IN THE WORD, IT{4 SPACES}WIL
    L SHOW IN ITS"                 :rem 140
928 PRINT"PROPER SLOT. ALL{6 SPACES}LETTE
    RS USED WILL BE{2 SPACES}DISPLAYED FO
    R"                             :rem 46
929 PRINT"{DOWN}{4 SPACES}{RVS}PRESS ANY
    {SPACE}KEY":POKE198,Ø:WAIT198,1
                                   :rem 203
930 PRINT"{CLR}{DOWN}REFERENCE. MULTIPLE
    {3 SPACES}OCCURENCES OF THE SAMELETTE
    R WILL BE SHOWN"               :rem 222
932 PRINT"IN ALL APPROPRIATE{4 SPACES}SLO
    TS.{19 SPACES}AFTER GUESSING A":rem 1
933 PRINT"WORD, PRESS:{DOWN}{12 SPACES}
    {RVS}F3{OFF} TO QUIT,OR{DOWN}
    {9 SPACES}{RVS}F5{OFF} TO GUESS ANOTH
    ER"                            :rem 235
952 PRINT:PRINTTAB(6);"GOOD LUCK!":rem 74
954 PRINT"{3 DOWN}{RVS}PRESS ANY KEY TO S
    TART":POKE198,Ø                :rem 174
956 GETAD$:IFAD$=""THEN956         :rem 243
990 RETURN                         :rem 130
1000 DATA DEGREE,DIVISION,SCROD,NAIVE,THI
     NKER                          :rem 159
1005 DATA WATER,LIGHT,REGIME,REVAMP,HYMN
                                   :rem 75
1010 DATA REGENCY,SYMPATHY,COUPON,PLANT,S
     POTLIGHT                      :rem 41
1015 DATA EXPRESS,AARDVARK,RUBBER,EMINENC
     E,BOOMERANG                   :rem 167
1020 DATA POETIC,EARTHQUAKE,MAIL,PARALYZE
     ,HEAT                         :rem 233
1025 DATA LAPSE,NITROGEN,GLASS,IDIOT,MEMO
     RY                            :rem 57
1030 DATA FLOWER,COMPUTER,LANDMARK,MESSAG
     E,CLARITY                     :rem 51
1035 DATA AMAZING,HARMONY,GALLON,JELLYFIS
     H,FLAME                       :rem 132
1040 DATA ENVIOUS,DOORBELL,DESTINY,DAISY,
     CORSAGE                       :rem 169
1045 DATA CANARY,BOYCOTT,OFFER,BENEFICIAL
     ,ARMADILLO                    :rem 63
1050 DATA ANGELIC,MONTH,MERRY,MARGARINE,L
     ODGE                          :rem 153
1055 DATA ORIGINAL,OXYGEN,SKIING,PLASMA,P
     REMATURE                      :rem 252
1060 DATA SPECIAL,REGARD,REFUGEE,SHAKE,WA
     TERCRESS                      :rem 185
1065 DATA SALOON,WASHABLE,WHATEVER,YOLK,W
     OOLLY                         :rem 52
1070 DATA ACTION,ZENITH,YELLOW,TRICYCLE,Y
     AM                            :rem 68
1075 DATA FETCH,PRICE,CHEMICAL,DOWNWIND,H
     IBERNATE                      :rem 166
1080 DATA COUNTERACT,CLOVERLEAF,FROG,FLEX
     IBLE,QUEEN                    :rem 101
1085 DATA PRECEDENT,ORANGE,CONSTRUCT,UNIC
     ORN,IMPORTANT                 :rem 143
1090 DATA MEDALIST,YOURSELF,NOVICE,GEOGRA
     PHY,EXPENSIVE                 :rem 129
1100 DATA MONITOR,HEADACHE,TELEVISION,TAX
     ,LANGUAGE                     :rem 10
2000 DATA A,B,C,D,E,F,G,H,I,J,K,L,M
                                   :rem 135
2010 DATA N,O,P,Q,R,S,T,U,V,W,X,Y,Z,-
                                   :rem 138
```

COMPUTE!'s Gazette for Commodore

AUTHOR GUIDE

COMPUTE!'s Gazette for Commodore is looking for interesting, useful articles aimed at beginning to intermediate VIC-20 and Commodore 64 users. If you have an article idea or a good original program, we'd like to see it. Don't worry if you are not a professional writer. We are more concerned with the content of an article than its style. Simply try to be clear in your writing and check your program for any bugs.

COMPUTE!'s Gazette for Commodore is a consumer-oriented magazine for VIC-20 and Commodore 64 users who want to get the most out of their computers in a non-technical way. It is aimed primarily at home users, not all of whom necessarily want to become expert programmers. If your article covers a more advanced or technical topic, you may choose to submit it to our companion publication, **COMPUTE!**. If you submit an article to one of our magazines and we believe it would be more suitable to the other, we will transfer your submission to the right editors. The basic editorial requirements for publication are the same for both magazines; so are the payment rates.

The following guidelines will permit your good ideas and programs to be more easily edited and published. Most of these suggestions serve to improve the speed and accuracy of publication:

1. The upper left corner of the first page should contain your name, address, telephone number, and the date of submission.

2. The following information should appear in the upper right corner of the first page. If your article is specifically directed to either the VIC-20 or Commodore 64, please state which one. In addition, please indicate the memory requirements of programs.

3. The underlined title of the article should start about 2/3 of the way down the first page.

4. Following pages should be typed normally, except that in the upper right corner there should be an abbreviation of the title, your last name, and the page number. For example: Memory Map/Smith/2.

5. Short programs (under 20 lines) can easily be included within the text. Longer programs should be separate listings. *It is essential that we have a copy of the program, recorded twice, on a tape or disk.* The tape or disk should be labeled with your name and the title of the article. Tapes are fairly sturdy, but disks need to be enclosed within plastic or cardboard mailers (available at photography, stationery, or computer supply stores).

It is far easier for others to type in your program if you use CHR$(X) values and TAB(X) or SPC(X) instead of cursor manipulations to format your output. For five carriage returns, FOR I=1 TO 5:PRINT:NEXT is far more "portable" to other computers with other BASICs and also easier to type in. And, instead of a dozen right-cursor symbols, why not simply use PRINT SPC(12)? A quick check through your program – making these substitutions – would be greatly appreciated by your editors and by your readers.

6. If your article is accepted and you have since made improvements to the program, please submit an entirely new tape or disk and a new copy of the article reflecting the update. We cannot easily make revisions to programs and articles. It is necessary that you send the revised version as if it were a new submission entirely, but be sure to indicate that your submission is a revised version by writing "Revision" on the envelope and the article.

7. All lines within the text of the article should be spaced so that there is about 1/2 inch between them. A one-inch margin should be left at the right, left, top, and bottom of each page. No hyphens should be used at the ends of lines to break words. And please do not justify. Leave the lines ragged.

8. Standard typing paper should be used (no onionskin or other thin paper) and typing should be on one side of the paper only (upper- and lowercase).

9. Sheets should be attached together with a paper clip. Staples should not be used.

10. A good general rule is to spell out the numbers zero through ten in your article and write higher numbers as numerals (1024). The exceptions to this are: Figure 5, Table 3, TAB(4), etc. Within ordinary text, however, the zero through ten should appear as words, not numbers. Also, symbols and abbreviations should not be used within text: use "and" (not &), "reference" (not ref.), "through" (not thru).

11. For greater clarity, use all capitals when referring to keys (RETURN, TAB, ESC, SHIFT), BASIC words (LIST, RND, GOTO), and three languages (BASIC, APL, PILOT). Headlines and subheads should, however, be initial caps only, and emphasized words are not capitalized. If you wish to emphasize, underline the word and it will be italicized during typesetting.

12. *COMPUTE!'s Gazette* for Commodore pays between $75 and $1000 for published articles. In general, the rate reflects the length and quality of the article. Payment is made upon acceptance of an article. Following submission (Editorial Department, *COMPUTE!'s Gazette* for Commodore, P.O. Box 5406, Greensboro, NC 27403) it will take from four to six weeks for us to reply. If your work is accepted, you will be notified by a letter which will include a contract for you to sign and return. Rejected manuscripts are returned to authors who enclose an SASE. We do not consider articles which are multiple submissions. If you wish to send an article to another magazine for consideration, please do not submit it to us.

13. Articles can be of any length – from a single-line routine to a multi-issue series. The average article is about four to eight double-spaced, typed pages.

14. If you want to include photographs, they should be 5x7, black-and-white glossies.

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Execution Time (secs.)	30	630	490	51	55	
Object Code Size (bytes)	128	255	329	181	415	
Program Load Time (secs.)	3.2	3.8	6.3	11.2	23.5	
Compile Time (secs.)	8.5	—	—	3.9	108	

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- Structured procedural language with indentation
- Fast, 1-pass compiler
- Simplified syntax requirements
- No line numbering required
- Long variable names
- Global, Local, & Arg variables
- Byte, Word, Integer & Real types
- Dec or Hex number types
- Functions w/passed arguments
- Procedures w/passed arguments
- Built in I/O library
- Arrays, strings, pointers
- Control Statements: IF-ELSE, IF, WHILE, FOR, CHOOSE, BREAK, REPEAT, INCLUDE, NEXT, ESCAPE, REFUGE
- Compiler I/O from/to disk or memory

EXECUTIVE
- Command oriented, w/line editing
- Memory resident
- Allows multiple user programs in memory at once
- Function key definitions
- Program abort and pause
- 22 Resident system commands, 8 user-defined resident commands, no limit on disk commands
- Prior command recall
- I/O Re-direction to disk or printer
- Batch jobs

EDITOR
- Full-screen, cursor driven
- Function key controlled
- Line insert, delete, search
- String search and replace
- Block copy, move, delete & write to/read from file
- Auto indent, undent support

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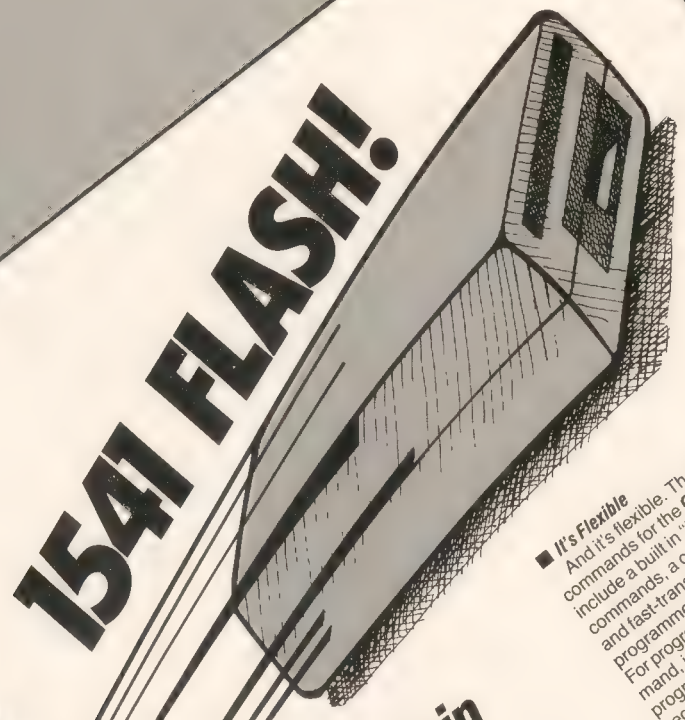

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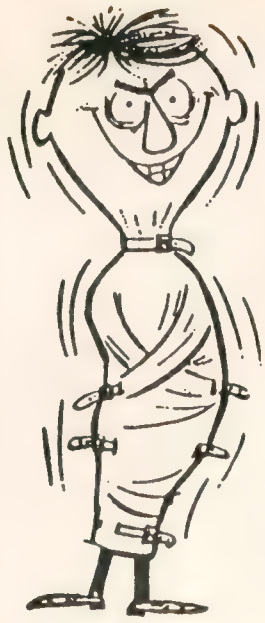

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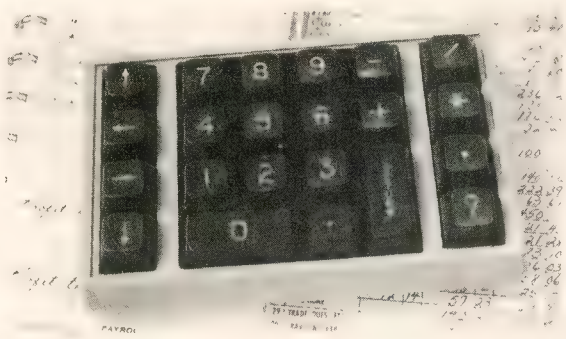

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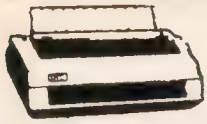

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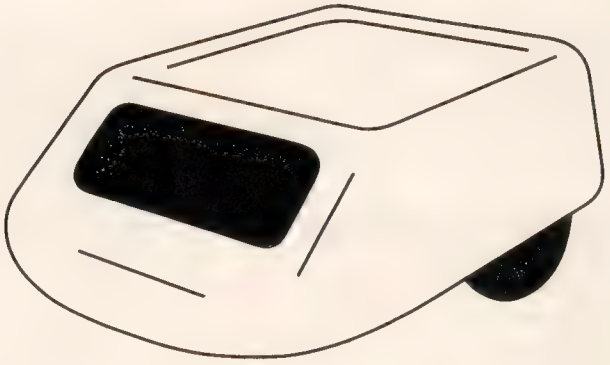

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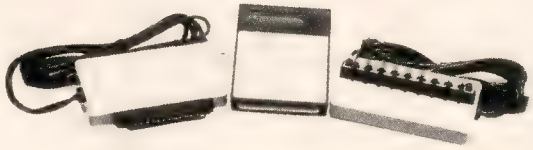

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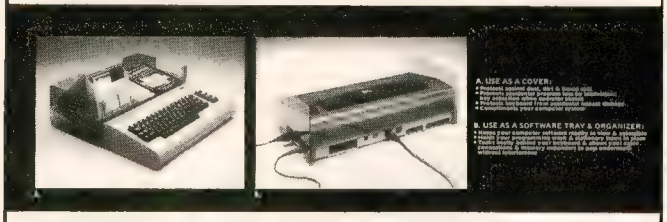

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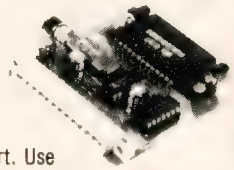

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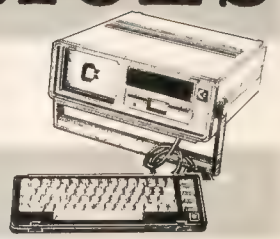

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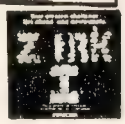

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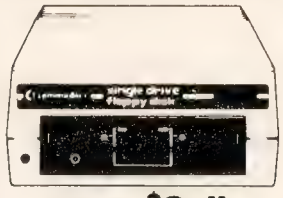

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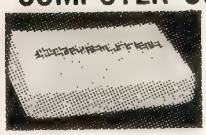

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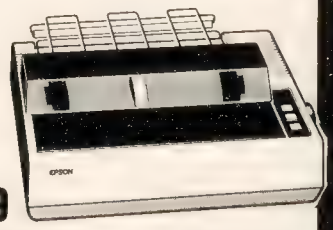

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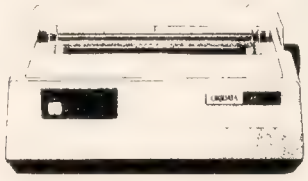

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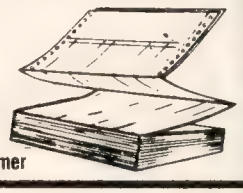

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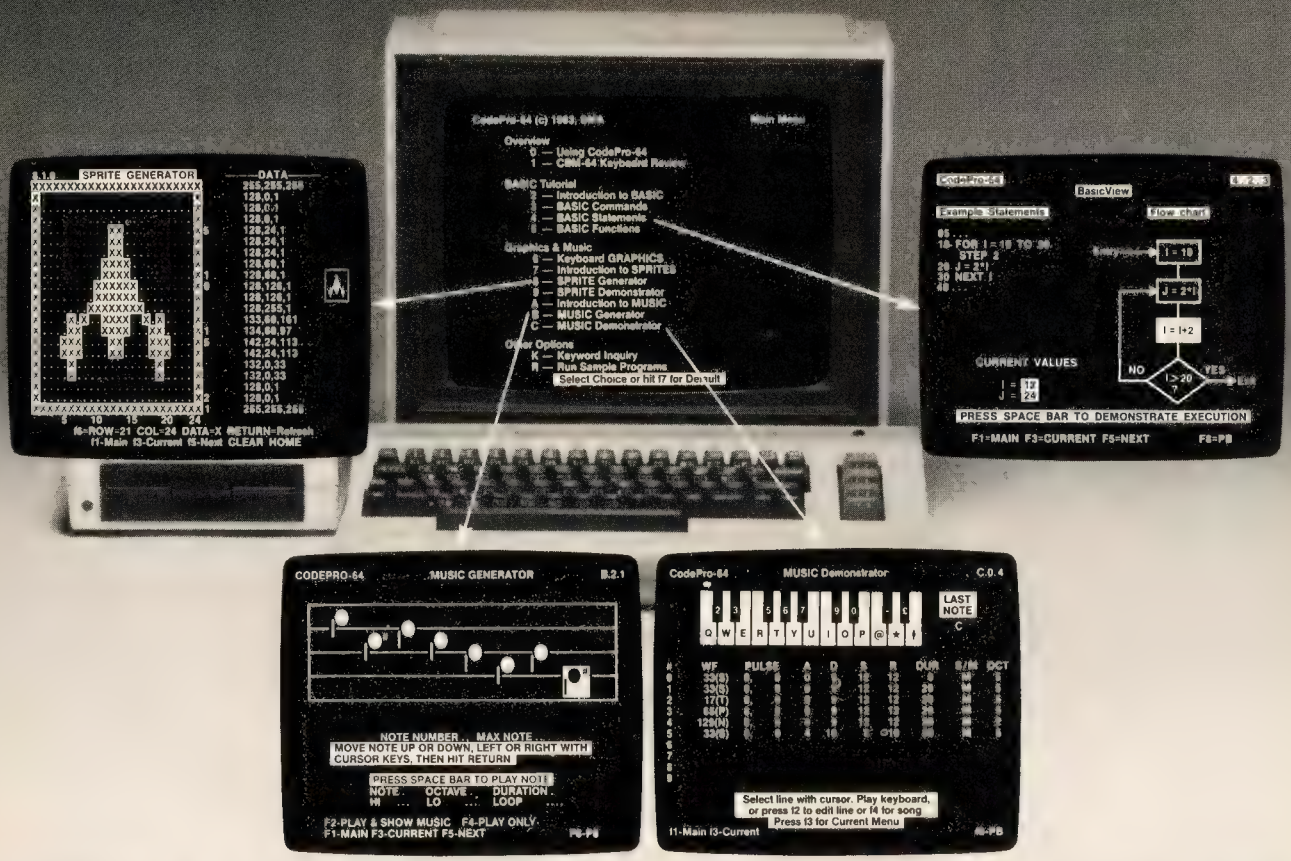
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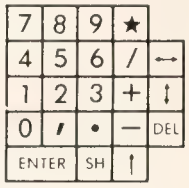

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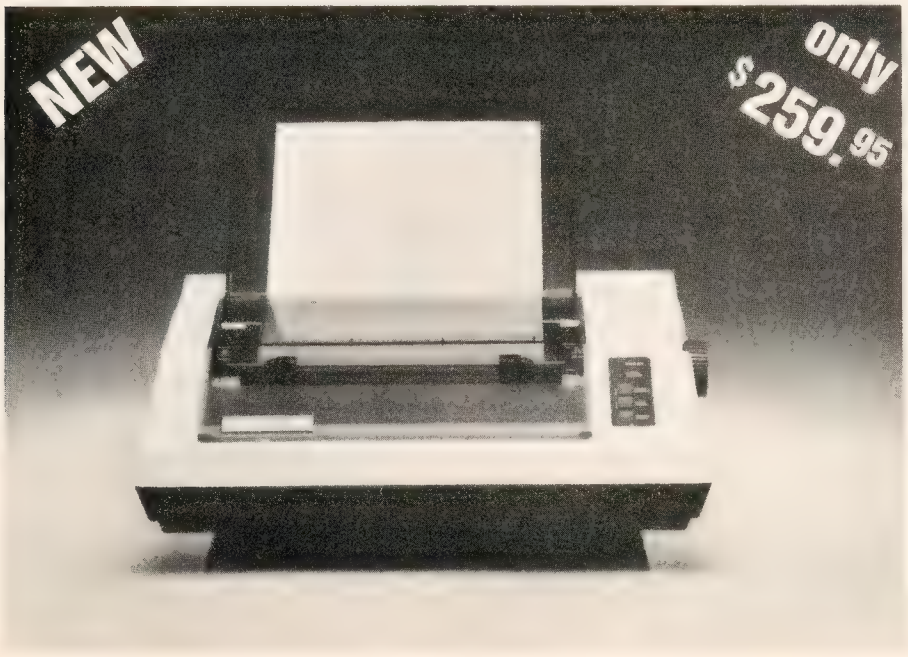

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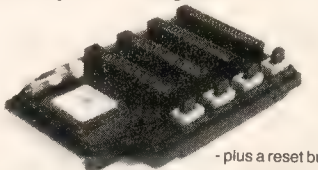

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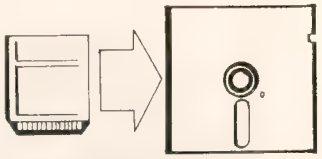

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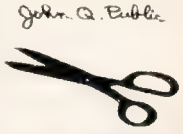

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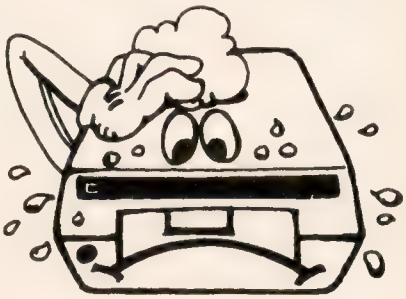

Most of them are, you know. Commodore makes a great disk drive. Only trouble is, they suffer from read and write problems frequently. And almost always, it means a trip to the shop for a head alignment. Maybe you can afford to have your drive out of commission for a while. And to pay to have your drive repaired. But we've been told that most of these problems occur because the drive has overheated, throwing the head out of alignment because of parts expansion.

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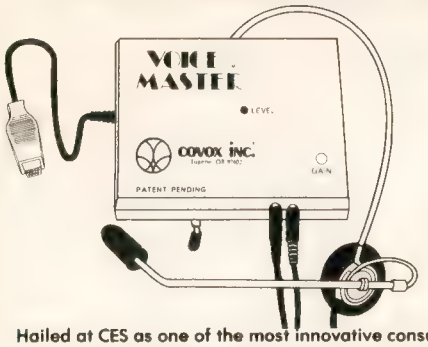

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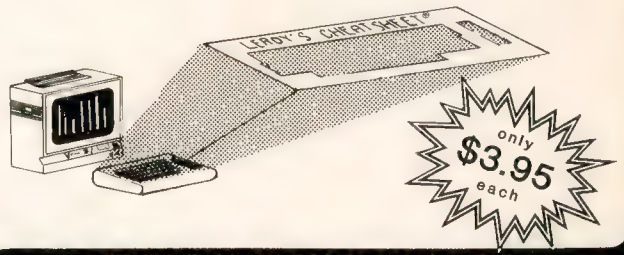

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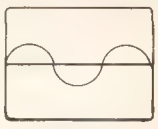

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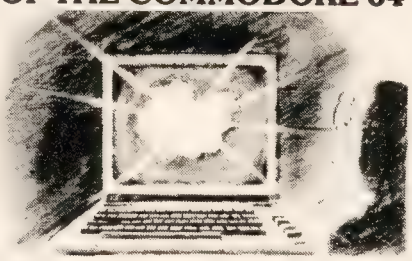

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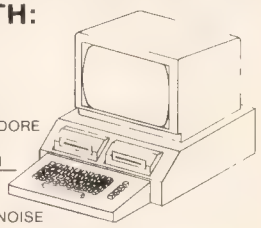

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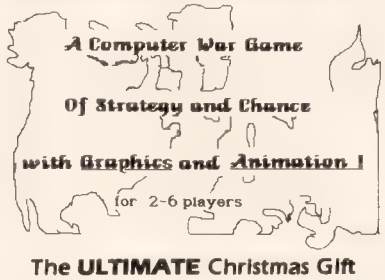

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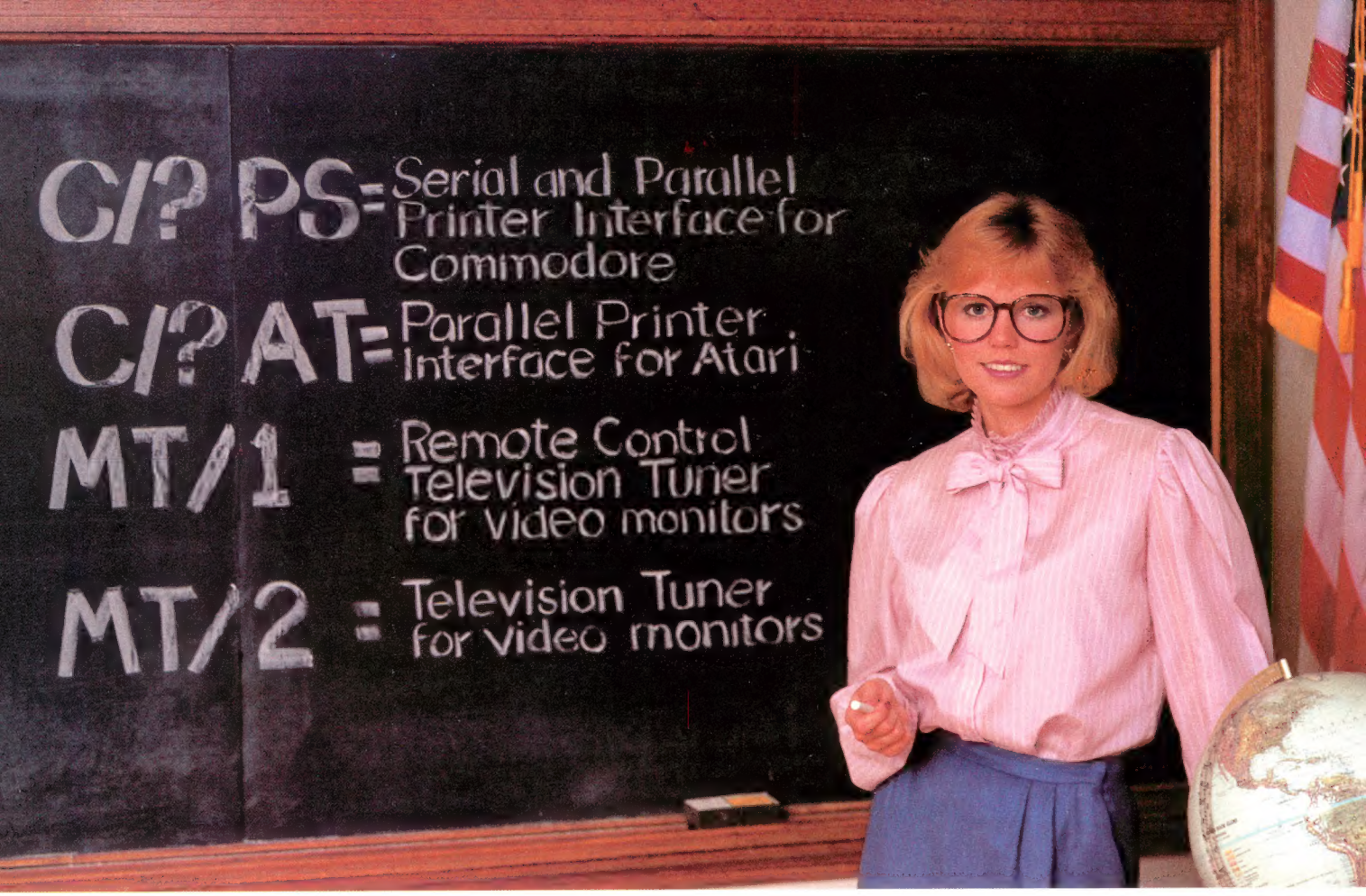
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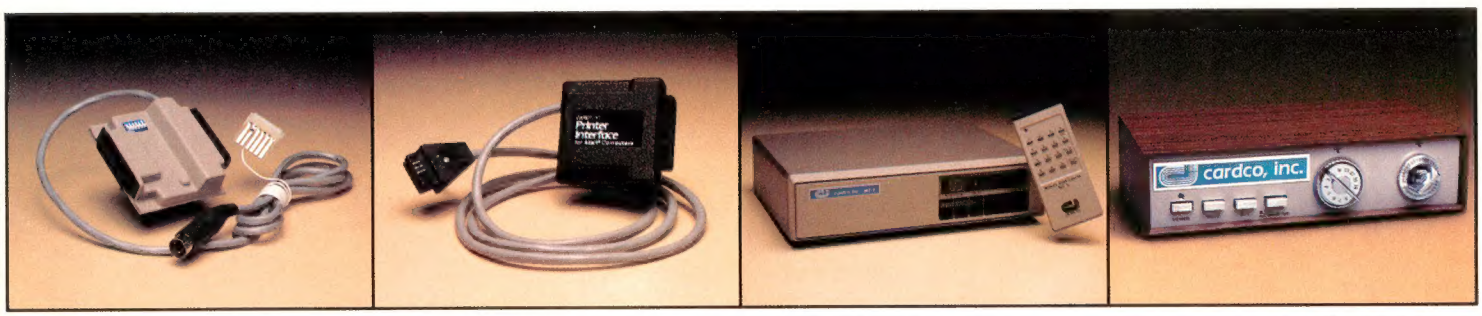

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6:00

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6:30

MATH FACTS

(Ages 5 to 10) (Micro School) Educational TV. Practice in basic math facts. Several levels. (Easy to hard) (Diskette)

7:00

FRENZY/ FLIP FLOP

(Ages 6 to 14) (Milliken Edufun) FRENZY (subtraction and division) The hungry gator arrives... save the fish... play the BONUS game... FLIP FLOP (transformed geometry) look at the two figures... do they need to flip, turn or slide? (Diskette)

7:30

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8:00

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8:30

THE MANAGER

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9:00

MAGIC DESK I

The scene opens on an office desk, complete with digital clock, typewriter, wastebasket and file cabinet. Select functions (typing, filing, editing) by pointing animated finger (Cartridge)

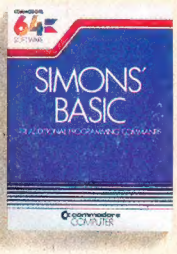
9:30

INTER-NATIONAL SOCCER

(Gold Medallion Game) Sports highlight. With passing, kicking, diving goalies, even trophies! Great color, 3-D realism. No locker room interviews. (Cartridge)

10:00

SIMONS' BASIC



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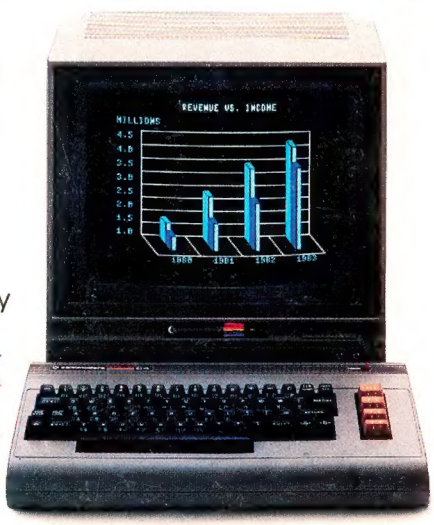

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